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The Development of Street Lighting in New York.

Mr. C. F. Lacombe, Chief Engineer of Water Supply, Gas and Electricity, city of New York, in speaking to the New York Section,[1] on this topic, stated that street lighting in New York presented many diversified problems to the engineer. The lighting must be proportionate to the needs of the various streets and their importance. The system must be capable of increase from time-to-time without extensive change of equipment, and must be laid out on economical and efficient lines. The artists and the engineers had their sides of the problem, but one should not be favored at the expense of the other. The design should not be too artistic nor costly, and the engineer should insist upon the most efficient and economical devices to produce the greatest illumination at the lowest cost. Diffusing globes and shades should be used to prevent glare, and the more powerful sources required special attention as regards spacing and height of suspension. The endeavor had been to make the lighting of the city of New York attractive and artistic, within reasonable limits of efficiency and usefulness. Progress in street lighting being necessarily slow and conservative, new units cannot be adopted without careful study and trial.

In New York to-day, arc lamps are used on both alternating and direct current, and of multiple and series systems; the incandescent lamp is used in various sizes in carbon, metallized, and metallic filament types. Gas mantle lamps are used, both with upright and inverted mantles, increasing the number of mantles where higher intensities of illumination are desired. Naphtha vapor lamps are used in some parts of the city where neither gas nor electric service is available. In Manhattan, where the greatest congestion exists, they are now trying out the long burning carbon flame arc lamps, and have installed a limited number of these lamps on Broadway and on Seventh avenue.

Gas supply for mantle lighting is available throughout the greater city, except in a few remote sections.

In Greater New York there are now used:

19,180 inclosed carbon arc lamps.
17,991 incandescent electric lamps.
78 flaming arc lamps, permanent and on trial.
44,653 single upright mantle gas lamps.
28 inverted mantle gas lamps, on trial.
1,816 single upright mantle naphtha vapor lamps.

A total of 83,746 lamps of all types. These are furnished by 28 companies and are used in the following manner: Inclosed carbon arc lamps, reinforced by flaming arc lamps at points of great congestion; inclosed carbon arc lamps on main avenues and business streets, practically over the whole length of these streets in Manhattan and as far as necessary in other boroughs, using the tungsten incandescent electric, and gas mantle lamps towards the ends of the streets. Gas mantle lamps are generally used in the residence districts and on streets on which there is little night traffic. Ten years ago when Mr. Lacombe first took up the work of this department the illumination of Manhattan and the Bronx was inadequate, unsymmetrical, and out-of-date. The arc lamps on the main avenues were insufficient, were often spaced too far apart and not symmetrical either in alignment or in height. Gas flame lamps were in the majority, with gas mantle and electric arc lamps often mixed with them. As soon as a plan of lighting had been developed, all gas flame lamps were discontinued. The numbers of arc lamps in streets and avenue intersections were practically doubled, and were arranged as symmetrically as possible, so that the illumination was the best possible for the funds allowed. Gas mantle burners were placed on the existing lamp posts on all residence streets where arc lamps had not been installed. This system proved to be efficient, and improvements since that date have been made along these same lines resulting in a system of lighting sources in long straight parallel lines, as well illustrated in Seventh avenue above Central Park, and Fifth avenue from Washington Square to 50th street, and on almost all of the streets and avenues in Manhattan, east and west, as well as north and south. Great care has been exercised to avoid freak lighting. Mixed lighting has either been done away with, or is now in the process of removal, and in the last 10 years the illumination in Greater New York has increased 118 per cent. This change has been so gradual that few in the city realize the improvement, although the plan has been successively approved by the commissioners of four administrations of the city government. Mr. Lacombe believes that if the city were thrown back in a day to the lighting of 10 years ago, the contrast would be so great as to cause a riot.

1. Illuminating Engineering Society.

New lighting problems are worked out mathematically and geometrically along the lines of proper illumination design. The entire plan is worked out on paper, then a temporary equipment is erected and the actual results noted in the trial installation, and checked by photometric measurements on the street. All the various reflecting and diffusing devices, and lamps that come on the market, are thoroughly tried out, and when new equipment is adopted it is only after the fullest and most complete engineering analysis. Lighting in this city is no longer installed by guesswork. The design of lamp posts is given considerable thought, and full-size plaster models are made and revised. Patterns are developed and corrected until a satisfactory and harmonious result is attained. In this way artistic effects can be best combined with good construction. The posts are then submitted to the Art Commission and its criticisms are embodied in the final result. It is through this development that the posts and brackets used in New York city have attained such a degree of artistic perfection.

With few exceptions, the arc lighting posts and fixtures belong to the companies, and all the gas lamp posts belong to the city, as do the tungsten posts in the streets and parks on underground service. The lanterns and lamps are the property of the various companies.

Mr. Lacombe showed some 70 interesting lantern slides beginning with the old cast iron post, which has been in use nearly 50 years, that was designed for an open flame gaslight with a small lantern, and now used for mantle lamps with a lantern weighing 32 pounds. These posts have outgrown their usefulness and are certainly not suitable for the higher candle power lamps. He then showed the old series open arc lamps and posts, bringing out the artistic development of the later day lamps. The slides of Fifth avenue showed the new twin-posts, with 250 watt lamps, then the newer posts with 325 watt lamps, which were then compared with the present twin-posts of greater height, which are equipped with 450-watt inclosed carbon lamps. The high power flame arc lamps used at points of congestion are hung at a height of about 40 feet. The new posts for gas and tungsten lamps for the side street lighting will be 14 feet 6 inches high, in order to get the proper distribution of light from the larger sources. In showing a night view of the New York City Public Library, Mr. Lacombe stated that he proposed to the architect of the library that the lamp posts, which would ordinarily be used on that side of the street, be moved to the opposite side. This resulted in bringing out the beauty of the architecture of the building, and illuminated the front of the building to an intensity of about 1-tenth of a foot-candle. A similar proposition was also taken up later by the College of the City of New York.

In closing he remarked that work in the lighting field was particularly interesting, and that the men who were now employed in the department might very properly be called "slaves of the lamp," because of the fascination that this work had for them and the demand it made upon their time, at a sacrifice of many hours, which the average man devoted to pleasures.

A Complete Analysis of Coal Gas.

In a recent bulletin of the French Academy of Sciences, M.M. Lebeau and Damiens describe a method of determining the combustion of mixtures of hydrogen and saturated hydrocarbons, and give the results of three analyses of coal gas. A measured volume of the gas is run through air-cooled condensers and separated into two portions; the first containing the non-condensable gases—hydrogen, methane, carbon monoxide, nitrogen and oxygen—the second, consisting of saturated hydrocarbons, homologues of methane, ethylene and acetylene carbides, carbonic acid, vapors of heavy hydrocarbons and water.

The gaseous products obtained by the first separation are averaged as follows: The mixture, treated first with potassium pyrogallate, to absorb the oxygen, and then with acid cuprous chloride to estimate the carbon monoxide. After elimination of the hydrochloric acid vapors, eudiometric combustion of the mixture of nitrogen, hydrogen and methane effected; pure oxygen utilized. The excess of oxygen then absorbed by potassium pyrogallate, which allowed of the direct estimation of the nitrogen. The small quantity of carbon monoxide produced in the last operation was taken into account. To collect the condensable portion, extraction was made by means of a mercury pump, care being taken to keep the condensers 23° C., to avoid entrainment of the steam and heavy hydrocarbons. The gaseous volume being known, the carbonic acid is analyzed by absorbing it with potassium. The acetylene carbides were then estimated with the authors' alkaline iodomercuric reagent, referred to in a previous paper, and the residue subjected to the action of sulphuric acid of 63° B., which removes the propylene and its superior homologues. The sulphovanadic reagent is then employed to determine the proportion of ethylene. After this is left a mixture of saturated gaseous carbides, which is fractionated so as to convert it into portions the compositions of which are estimated from the eudiometric analysis. The results are given in the following table:

	Paris Gas.	Arcueil Gas	Montlhery Gas.
Oxygen	0.04	0.85*	traces
Carbon monoxide	5.66	5.08	5.74
Hydrogen	54.08	50.15	55.98
Nitrogen	3.47	8.09*	3.36
Carbon dioxide, etc	1.81	3.48	1.65
Methane	28.59	28.01	29.11
Ethane	0.75	0.77	0.42
Propane	0.12	0.118	
Butane	0.014	0.017	
Acetylene carbides	0.096	0.095	0.08
Propylene and homologues	0.48	0.40	0.18
Ethylene	2.12	1.69	1.81
Steam, benzol, etc. (by difference)	2.77	1.25	1.67
	100.00	100.00	100.00

*The authors thought these constituents might be due to air a cidentally introduced. Analysis made on a sample taken after an interval of a few days had the same composition.

These analyses, which the authors consider the most complete hitherto made, prove the presence of the superior homologues of methane. The relative proportions of the different carbides was determined. It is the same for the ethylene carbides. As regards the acetylene carbides, the authors were able, working with a sufficient volume of gas, to regenerate them from their mercuric combination, and note that they mainly contained acetylene, with small quantities of heavier acetylene carbides. They call attention to the fact that the proportion of carbon monoxide is less than that generally supposed in illuminating gas; and they say this is due to the fact that analysis of this compound is made in a mixture containing only gases which are strictly without action on the cuprous reagent.

[Official Report.—Revised by the Secretary.—Continued From Page 275.]

PROCEEDINGS, NINTH ANNUAL MEETING, ILLINOIS GAS ASSOCIATION.

Held in La Salle Hotel, Chicago, March 19 and 20, 1913.

First Day—Morning Session.

The President introduced Mr. A. S. B. Little, who read the following paper on

GAS PURIFICATION.[1]

It is necessary to preface this paper with the statement that same was prepared by request of the Association, and it is my desire to refrain from statements or reports calculated to advertise any particular product. Efficient and economical purification of gas is a subject deserving attention. Some gas engineers are particularly well versed in present methods and others are devoting time and thought to new systems; but it is a deplorable fact that very few of them desire, or will consent, to make public the results of their investigation and experience.

All of us suffer from your desire to remain in the background, and it is an earnest hope that you have come prepared to remedy the fault by starting and continuing a discussion on purification which will go into the records as a complete report of present day methods.

In America we are ahead of Europe, although it may be best to qualify the statement by adding that in England it seems they have more generally adopted the economic methods which originated in America. They are now beginning to adopt systems of operation (which many engineers there claim are unique, personal inventions) that are nevertheless the result of ingenuity on the part of Mr. B. E. Chollar and others.

Mr. Chollar, in 1899, was the first to think out and put into use the plan of reversing the order of the purifiers when using air in the gas, instead of dumping the oxide to revive it. It is a deplorable fact that this epoch-making idea was allowed to languish and decline.

1. This paper is slightly abridged.—Eds.

Although now being revived, especially abroad, it has not yet been fully recognized as the one really great advancement in gas purification methods during the last two decades.

A brief recital of Mr. Chollar's system, as now in use, is necessary.

First of all, let me say that in his paper he made a remark about oxide that has paved the way to great advancement in efficiency; and, again, on this score, he has not been given the credit. He said, in 1900, "It has been, and is now, commonly supposed that the hydrated sesqui-oxide of iron is the best form of oxide, and that the anhydrous forms of oxide are comparatively inefficient; but, so far as my own experience goes, and it is supported by many, the anhydrous forms are much the better."

That was a claim, gentlemen, formulated in 1899, at which time it was considered heresy—and is now in most parts, for that matter. Coming to the rotation system referred to, it may be best to state the case in the inventor's words. He said:

"When air is admitted in proportion, and the direction of the flow through the beds reversed at proper intervals, a new process is effected, the action of which is as follows: When foul gas, mingled with air, enters a purifying bed, the hydrogen sulphide attacks the ferric oxide, reducing it to ferrous sulphide and ferrous oxide. The ferrous sulphide so formed is immediately converted into ferrous oxide and the sulphur deposited.

"Ferrous oxide will not combine with hydrogen sulphide, nor can air—in the presence of a large proportion of hydrogen sulphide—oxidize it to ferric oxide. As the gas flows through the bed, the proportion of hydrogen sulphide continually decreases, while the quantity of air present remains practically the same; hence the intake part of the bed will be reduced to ferrous oxide before the remaining part has lost its activity. If, therefore, at this time, the direction of flow be reversed, the clean half of the bed will remove the hydrogen sulphide as before, leaving the full proportion of air with the gas, free to revive back to ferric oxide the part of the bed that has previously been fouled."

That was a remarkable statement at the time it was made, and is even more remarkable when we consider the claims and statements made by others in recent years. In an editorial in the London *Journal of Gas Lighting* (November 19th, 1912), it was said, when referring to a paper by Mr. Townsend: "There is only one point to which any reference need be made here, and that is in connection with the part of the paper alluding to the use of air for revivification *in situ*. Mr. Townsend describes this as 'modern practice.' It was early in the 80's that the practice was first introduced by J. G. Hawkins." Now that may be, and no doubt is, correct; but not in connection with the combined system of using air and reversing the order of the boxes.

The first printed reference to the system that I have been able to find, following Mr. Chollar's paper, is in an article by Mr. H. L. Rice at the Ohio Gas Light Association meeting in 1904.[1]

In Mr. Rice's paper he has referred to the (as he called it "more recent") system of reversing the order of the boxes. He first tried the effect without air, from January, 1902, to January, 1903. The results were good, doubtless due to the fact that in all commercial gas there are traces of air. Certainly, the revivification *in situ* could not have taken place in the absence of air. During the time mentioned the boxes were reversed regularly in action once a week, as follows:

"All new material, first filling: Boxes ran from January 1st, 1902, to March 1st, passing 13,985,000 feet. Box A changed. Boxes ran from March 1st to May 21st, passing 16,176,000 feet. Once used material in B. Condition of A governed. Box B changed. May 21st to September 23d, passing 22,717,000 feet. Material once used. Box A changed. September 23d to December 9th, passing 21,254,000 feet. Box B changed December 9th, 1902, to November 23d, 1903, passing 87,752,000 feet."

You will note that the run from December 9th, 1902, to November 23d, 1903, when ½ of 1 per cent. of air was introduced after January 1st, 1903, the boxes passed, without being opened, about 4 times as much gas as without the air, and in this time were using once revived oxide. The labor during 1903 was 3-10ths of a mill per 1,000 feet. Mr. Rice drew the following conclusions, corroborating Mr. Chollar:

"Without air, some revivification, falling, however, within low limits. With ½ per cent. of air, revivification proceeds to high limits, giving 52,500 cubic feet per bushel per change. Revivification took place in the second box, acting feebly or not at all in the first, where the oxide was fouling from the hydrogen sulphide."

He claimed:

"Revivification *in situ* should, for efficiency, be conducted in the presence of the purified gas only."

The next authentic reference to the changing of boxes in backward rotation seems to be the article published in May, 1910, by Mr. Frank Prentice, of Ipswich. The paper was reprinted on page 9 of the "Pamphlet on Purification."

In parenthesis, I would like to say it was time we made some definite standard base for figuring capacities of oxides. What is a ton or a bushel of so-called oxide? Nobody knows. Mr. Rice's paper gives the unit as a bushel; but we know that a bushel of purifying material may contain from 12 to 50 pounds of active ferric oxide, the usual strength being from 21 to 30 pounds. In Europe we are confronted with the long ton, but we do not know just what a ton of purifying material consists of, because they use natural oxide, bog ore, iron rust, artificially precipitated oxide, burnt oxide and mixed oxide and lime. I suggest that in future all figures on purification be given on the basis of actual dry ferric oxide in each cubic foot of purifying material.

In the Ipswich results we find that the system of working is not what is customary here. They work 4 boxes in the rotation system, and have 2 catch boxes, thus being able to work the 4 boxes until the fourth one shows 50 grains of H_2S per 100 cubic feet of gas. Very large purifier capacity seems to be in vogue there. Does it pay? I believe in many cases it does, because, where ground space is not expensive and is available, the cost of extra purifiers is soon repaid by the ability of foul oxide to contain over 60 per cent. of sulphur, and also by reason of the great amount of labor that can be saved. The Ipswich plan is to run a long time without changing the order of the boxes, and this makes catch boxes necessary. In Mr. Chollar's method it is my conviction that catch boxes are not necessary—even when you reverse the order of boxes and not the flow of gas through the box.

Let us examine some of the Ipswich figures. A purifier was charged with 100 tons of oxide on the 21st of November, 1907 (we can assume this represented 5,000 cubic feet of 25-pound oxide). It worked 16 months and then contained 49 per cent. sulphur. It was then taken out for reviving, and afterwards worked in the same box to December 31st, 1909, when it contained 55 per cent. sulphur and was discarded. That is to say, it was only taken out of the box once to revive it.

It was reversed 12 times in 25 months, and the 4 boxes passed 991 million feet of coal gas, over 400 grains H_2S per 100 cubic feet at inlet. One-fourth of this shows, say, 248 million feet of gas purified by 5,000 cubic feet of 25-pound oxide, equal to 49,600 feet purified per cubic foot of oxide, or, say, 60,000 feet per bushel with only one change. With more frequent switching that figure could be improved upon.

During the discussion a member said he did not agree that catch boxes were necessary, and he had worked the system 3 years with only 4 boxes (3 on and 1 off.)

Another article on this subject was prepared by John T. Sheard, who claims that, with a full set of four boxes worked in the order 1234 : 4123 : 3412 : 2341, the cleanest box always being put first in series, and changing every 24 hours, no catch boxes are required.

Mr. John Young, of Hull (formerly of Pittsburgh) seemed to be the only one, up to 1909, who was using Mr. Chollar's system. He made the claim that the fouled oxide was more readily oxidized *in situ* in the presence of moisture, especially if oxide was hot. He secured this by admission of a little steam, enough to give about 4 per cent. of moisture in the oxide, and cause an increase of about 20 per cent. in the temperature of the gas. I have devoted quite a lot of space to this question of reversing the order of the boxes, because it is one that apparently lends itself to use in all gas works, and is likely to lead to a saving of labor and a decrease of the nuisance caused by smell from unloading foul oxide. I am going to refer to another article, previously mentioned, written by Mr. C. Townsend and published in November, 1911. His plant consisted of 4 boxes, arranged in 2 pairs with common division plates. Each box is 36 feet by 25 feet by 5 feet, controlled by centerseal. Gas enters at the top. Each box holds 70 tons (say 3,500 cubic feet of 25-pound oxide). They also have 2 catch boxes.

A unique experience is reported, showing the necessity for admission of air when the rotation system is worked. At one time the air blower was stopped for 15 hours, and in this short space of time two

1. See JOURNAL, April 11, 1904, p. 45.

of the boxes fouled. It is noticed in this paper that, while it is possible, under ideal conditions, to work new material until it is fully charged without taking same from the purifier, it is not advisable to do so, as it has been noticed, in one or two instances, the plates of the purifiers have been broken by expansion of material, owing to the gradual accumulation of free sulphur.

I have never heard of such an accident with this system, and if any have it would be a good plan to publish same. The author showed that he changed one batch of material 5 times in fouling it, and the results indicated by gain of sulphur and loss or gain of moisture were:

	Moisture. Per Cent.	Sulphur. Per Cent.
First charge	55.00	nil.
Second charge	43.20	12.00
Third charge	26.30	19.18
Fourth charge	33.30	23.42
Fifth charge	17.00	42.78
Emptied	18.31	43.99

I do not consider this any too good a result, by the rotation system. Would it not appear from this that any expansion of the material caused by addition of free sulphur might be counterbalanced by loss in moisture?

From another point of view, using a porous oxide, would not the sulphur in combining with the oxide swell very gradually, and only take up the space existing around the mixed mineral and shavings? In this way, surely before any damage could be done to the purifier, the gradual swelling of material would so pack the same that it would be necessary to open up the box by reason of resistance to the gas passage.

Speaking of an early personal experience, about 1900, I remember making a drawing for Mr. John Myers, of Saltcoats, showing his system of injecting air into the inlet of purifiers by the aid of steam, a dry meter to measure the air being placed behind the steam jet. I refer to it because it shows that in a moderate sized summer town, 10 or 12 years ago, this system of Mr. Chollar's was being tried out, and used successfully.

Speaking of the point at which air should be admitted, and referring to a paper read in November, 1912, the London *Journal of Gas Lighting* says:

"He raises the old question, over which there has been controversy, as to which is the best place to introduce the air. He condemns its admission on the vacuum side of the exhauster; and his argument runs thus: If the vacuum decreases the amount of air also decreases, while if the vacuum increases the volume of air drawn in also increases. Assuming that the vacuum remains constant, the amount of air, he says, will also remain constant, and thus will not vary in proportion to the make of the gas; so that the percentage of air admitted will never be constant, unless both the vacuum and the make of gas are also constant."

Mr. Townsend is here criticising very large practice and experience. In many gas works the air is drawn in at the condensers, without any trouble being experienced. If the exhausters are governed by the vacuum in the foul main, when the quantity of gas decreases, the governor reduces the speed of the engine, and so the pull is lessened. The contrary happens if the volume of gas increases; and, this being so, there is automatically a relationship established between the quantity of air admitted and the volume of gas passing.

The author of the paper referred to uses a small exhauster, connected to the gas exhauster, and runs air pipes to the purifiers, with valves, so that the regulated amount of air can be put in where desired. In an editorial on this subject, appearing in the *Gas World*, it is stated:

"It is generally recognized as better to admit air at the inlet to the purifier valves rather than at the vacuum side of the exhauster; but the fact that it entails an additional motor accounts for the more general continuance of the latter method, particularly in small works, * * * the slight variation in proportion is negligible. As the number of retorts increases or decreases, the amount of air admitted can be readily adjusted by means of a rotary meter, and some of the best purification results are produced where no further adjustment is practiced."

Let us now proceed to consideration of other important matters. In America it is quite a common practice in preparing purifying material to use a small percentage of lime in the ferric oxide. This is a very good plan, but it can be improved upon.

It is well known that ferric oxide will remove quite a lot of H_2S. I mean, it does not seem to matter how many grains of H_2S are in the gas, the first purifier removes the bulk of it. In other words, a box taking 365 grains from a 400 grain gas will apparently remove just as easily 565 from a 600. Then in the second box it is quite easy to take out, say, 32 out of the remaining 35. This is with straight oxide, not containing lime. Now, 2 grains, or even less, of H_2S per 100 cubic feet of gas will show a stain on lead acetate paper just about as readily as 50 grains will. And yet, by the customary system of testing, many a gas works will dump a box of oxide because the gas shows a stain.

Would it not be a good plan to always have a catch box, working last in the series behind 2, 3 or 4 boxes, filled with either lime alone, or with oxide, to which 15 pounds of lime has been added to each cubic foot? Possibly many of you have done this; and I believe, in Jacksonville, Fla., Mr. Hoyt takes his seemingly spent oxide, mixes a lot of lime with it, and puts it into the last box of three, always keeping it last in the series. I believe, also, Mr. James Young, of London, Ontario, uses the top tray in the last box for holding a supply of lime.

In most small plants, if they adopt some such system, and test the gas comparatively at each box by analysis, the cost of labor, due to too early dumping of boxes, could be about cut in half. For quick determinations, a quantitative test for hydrogen sulphide can be made by the Tutwiler burette, using starch and iodine stock solutions. It is simple, quick, cheap and remarkably accurate.

Coming now to considerations of safety. What are the chief causes of accident? First, we may have firing of new oxide before it is put into the box, caused by the presence of free iron. This is pure carelessness, and should never take place. Then, we may have firing in a box, caused by the iron oxide and sulphide, worked without air coming into contact with air suddenly, inadvertently admitted along with the gas. This causes very rapid revivification of the sulphide, generating heat enough to destroy the grids and make the purifier plates red hot. In the same way, partly fouled oxide may, when the purifier cover is raised, fire very rapidly and cause consternation in the plant.

Revivification *in situ* is the remedy, preferably with the rotation system, as in that case a small amount of air constantly passing partly revives the sulphided oxide in a gradual manner. For this reason, before you open and dump a box, always put it on last in the series for about 24 hours, so that the small percentage of air will partly revivify the sulphide, and it will not then heat rapidly when the cover is taken off.

Many gas companies do not keep accurate records of their oxide, neither do they know actually just how useful their stock is. This was made very clear by the report recently issued by the chief engineer of an important operating company. The fault of over-confidence is confirmed from my own experience, through companies reporting they have enough oxide on hand to last at least 2 years, and then sometimes within 2 or 3 months, they wire rush orders due to the fact that the oxide stock they relied on was useless.

This hurt in several ways. First, they did not have material when they needed it; and, second, they had not charged off the proper amount each year for oxide used. The recommendations of the chief engineer were, that the manager must keep on record the total number of cubic feet of oxide he has on hand. He counselled, where two boxes are in use, an extra bed of oxide be kept in stock. Each bed to be numbered or lettered and used in order. This sounds like a platitude; but how many or how few follow the rule?

When it becomes necessary to dump a box, the foreman should note on his daily report, the day and hour when put out of action; time and labor handling oxide; and, hour and station meter reading when box is turned on again. This not only keeps a record of work done, but a guide to the manager in calculating the time to put in orders for fresh oxide. This also enables him to charge off the correct amount monthly, and keep his stock account in order. In order to calculate with fair accuracy, we might use the following approximate figures:

If a cubic foot of oxide contains 20 pounds of iron (iron, not oxide) it should absorb, without reviving, about 11.46 pounds of H_2S; or say, 80,080 grains. With Pittsburgh coal—say, .75 or 1 per cent. sulphur—this should mean, when entering the purifiers, the gas would contain about 4 grains H_2S per cubic foot. Thus we see 1 cubic foot of oxide should clean about 20,000 cubic feet of coal gas per charge, and approximately 200,000 cubic feet during its life. I estimate, from experience, the actual efficiency in most works is 10,000 feet per change, and about 120,000 feet during the life of oxide.

If oxide is handled in the old fashioned way, all revivification being done in the open, the greatest of care should be exercised in reviving it. New oxide, only slightly fouled, will heat up more rapidly than old oxide. For this reason it is necessary to watch it carefully when emptying the box. Get it out as quickly as possible, pile it in a triangular heap, 6 feet deep, as long as necessary, and keep check on its temperature for the first 4 to 8 hours. Once hot, the best plan is to rake the oxide into 4 equal triangular piles, in the form of rows with edges touching. It is safe to say that most oxides lack efficiency because they are not thoroughly revived before being put back into the box. In some plants insufficient water is used on the oxide when reviving it, and the men fail to break up the lumps. Really, all oxide should be screened when being revived in the open, as it is useless to put lumps into the purifier.

The water should be put on the large heap after the oxide gets hot, and not much more than the heat of the oxide will drive off. A soaked oxide will not purify gas as well as one just moist. When oxide is fairly old, it is necessary to keep it in a pile for at least 24 hours when reviving it, otherwise it will not get hot and the sulphided oxide must be left longer exposed to the atmosphere than is necessary when the oxide has only been once or twice used. When putting oxide back into a purifier, contrive to make its temperature about equal to that of the gas, or higher if the gas is below 50° F. In the winter time this can be accomplished by sticking an open steam pipe into the heap. This will help to revive the oxide, will keep it moist and raise the temperature. Before you discard oxide, have it analyzed, because many a batch is discarded before it is really foul. Up to 60 per cent. sulphur is not too high, whereas 35 to 40 per cent. more nearly represents the usual life. On the other hand, many oxides are put back into the purifier when their condition does not warrant further expenditure of labor.

If you are a mixer, be careful what wood shavings you use. Many woods, particularly oak, contain acid. This will destroy the efficiency of your oxide. Mr. George Evans told me of an experience he had in New Orleans with a batch he made up with iron borings. It was in a very large box and simply would not take hold at all. After some weeks, it was taken out and showed absolutely no traces of iron sulphide. The sponge was spread out and a solution made of hot lime and water was then sprinkled over it and, on being returned to the purifier, started up at once, doing excellent work.

Oxide must be in an alkaline form. That is why most makers of artificial oxide treat same with lime. I am in favor of the process when no other is known, but have preference for my own plan which is the subject of a patent application and will shortly be made public. Poplar and ash are not good woods to use, pine and spruce being the best.

It has been reported to me by two companies that the use of an iron refuse from the manufacture of salt, when used for purifying gas, caused the carrying over of a substance, which I believe is called iron carbonyl.

Mr. Stone, at the same meeting, also referred to this trouble, which, however, he thought was caused by the presence of free iron in the purifier mass. He had trouble of the same kind when using fine shavings, so he took out the oxide and completed the rusting process, taking 3 weeks to do it.

Mr. Hayward, who confirmed this opinion, claimed it took about 6 weeks to make artificial oxide from iron borings, without risk of burning the chips. He suggested, when trouble occurred, owing to the passing forward of the compound that we may call iron carbonyl, the use of some sort of filter in the last box would cure it. A layer of clay or lime, 3 or 4 inches thick, was offered as a solution of the trouble.

Mr. Light also made a suggestion that appealed to me, especially as it is in line with the new rotation system. He advocated never using new oxide in the last box, but always the putting of same in the first box, leaving older oxide in the succeeding boxes. This will catch any carbonyl. Also, as fresh oxide may pass very small traces of hydrogen sulphide, unless lime is added, this method of using new oxide in front of old has much to commend it. Maybe, too, an old oxide, which is packed with free sulphur, will absorb some of the sulphur compounds. I believe, when you put new oxide on first in the series, you can use almost any kind of wood chips, because, even if there is some acid therein, it will soon be counteracted by the traces of ammonia that pass over into the first purifier.

In this connection, reference may be made to the claim of Mr. Thomas Glover, that when an oxide is showing signs of exhaustion new life will be given to it if, by by-passing the scrubber for a few hours, some ammonia is allowed to deposit on the oxide. I can confirm this by experiments made during the last 12 months. The increased activity does not last very long, but it might tide many a plant over a trying period when waiting for new oxide. In regard to purifiers themselves, would suggest that no new ones be put in without complete valve system, enabling you to run gas through them in any order and in any direction.

The tendency in most plants is to fill a purifier and leave it unattended, but with best wishes for its success and good behavior. We devote a lot of time to the exhauster, almost petting it so that it will be good; also change, alter and test the scrubber and washer, and give a lot of attention to the condensers and more to the mains. Not too much by any means, but more than one ever thinks of giving to the poor old purifiers.

The purifiers cannot make money, it is true; but they can save money; yet the average gas man seems to desire, after filling the purifier, to banish same from sight and memory.

Pressure and temperature, coupled with system (routine simplified, not rules multiplied) are the causes of success in the purifier house no less than in the retort house or machinery room. And yet the number of gas works taking daily note and record of purifier house conditions, by means of temperature readings and pressure records, could be counted on the fingers of a one-handed panhandler.

Twenty minutes each day devoted to the purifier house would suffice to keep same working at concert pitch; but I have the temerity to say that in most plants 20 minutes per month would be nearer the mark. Some have a thermometer somewhere in the plant; but how seldom is one found in the purifier room?

The best kind of a purifier house is a portion of the United States—unchanged. Even where zero weather is found, the purifier house can be discarded. Instead of surrounding purifiers with an elaborate building, or making steel purifiers, and lining them inside or outside with brick or cement, why not sink the greater part of the box underground, then protect the covers, and put a light roof, with open sides and good ventilators over the boxes, not to protect them so much as to protect the men who have to work in them? There would be little extra labor entailed emptying a box, and it would be counteracted by the time saved in filling it. Leave the top flange of box about 8 inches above the ground, so that the shackles and grips for the dry seal can be easily worked.

Keep accurate records of the work done by each batch of oxide, so that the complete history of all oxide can be seen at a glance.

What arrangements should be made on large purifiers for (a), preventing loss of gas when they are opened; and (b), stopping to a large extent the passage of a large quantity of air direct to the holder when a purifier is turned on?

One arrangement I know of provides, on the inlet and outlet pipe of each purifier, a 6-inch flanged branch, to each of which a valve is fixed, locked when not in use. These valves lead to a common pipe which is carried to the foul main, suction side, between retort house and condensers. Before a purifier is opened the valve is turned so that gas is drawn out of the purifier into the gas main. As soon as a level gauge is shown on the 6-inch pipes the valve is shut off.

Similarly, when a purifier is re-charged, the air is drawn back gradually into the main, and so is not noticed, whereas if forced directly into the holder it might be detrimental and noticeable.

What about temperature? Mr. Rice, in his paper before this Association, recently said: "Heat your gas up a little, say, to 80° F. for purifying. Steam introduced directly into the gas after the scrubber is all right, if it does not make the oxide too wet." Some of you at that time advocated coils instead of live steam turned into the oxide. There are many views on this question. One claims free steam makes a kind of mud on the trays. Another claims he has worked 20 odd years with free steam, and by proper draining never suffered damage through back pressure or excess moisture. This matter of temperature is important with new oxide, but not so very important once the oxide has started to act. Anything over 50° ought to be sufficient when oxide has commenced to catch hold. Some times it will be found that a purifier begins suddenly to show excessive back pressure. At such time, before deciding to dump the oxide, first try the effect of reversing the order of the box. It is a strange fact that if a box which is throwing back pressure as a "first taker" is put on last in the series, the back pressure will rapidly diminish. This experience may not be general knowledge, but it goes to show one great benefit derived from the rotation system.

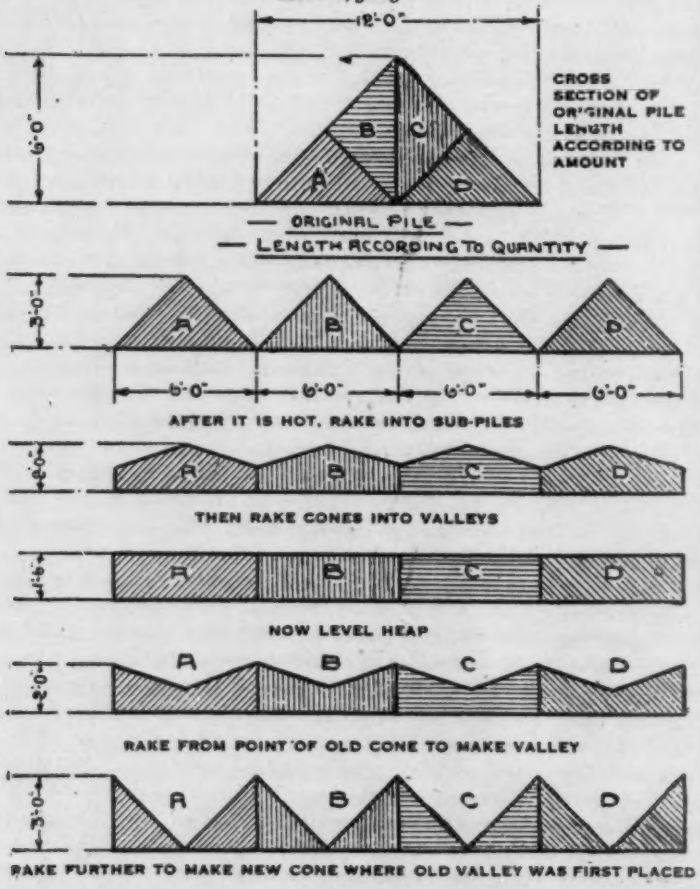
Recently a remarkably fine contribution to purification literature was made by Mr. Curphey, the Chief Inspector of Alkali Works,

Great Britain. It was devoted to treatment of satnrated gases in sulphate of ammonia plants; but, notwithstanding the difference between those and illuminating gas, the work he did is adaptable to gas works' practice. His article (published July, 1912) is a very long one, but we can give some conclusions based on his figures. He claims that the most favorable temperature for the maximum absorption of H_2S—either with or without air admitted with the gas—is around 140° F. Oxide sulphided at this temperature, on being revived, gives a maximum yield of free sulphur and the lowest possible amount of sulphur in other forms. He differs from most people in the claim that efficiency of oxide is controlled by the amount of hydration. Possibly for saturator gases this is so, but our experience with illuminating gas is not corroborative. He does not base his proposition of admitted air on the amount of gas, but on the percentage of H_2S in the gas. He states that the efficiency of the oxide is very much increased, in respect of the weight of sulphur absorbed by the admission of air with the gas at the rate of two volumes of air to one volume of hydrogen sulphide.

Speaking of "sourness" in oxide, causing it to be ineffective, he says the fouling of oxide at temperatures between 210° and 275° F. results in the formation of soluble iron salts, such as iron sulphate and disulphide, in considerable quantity, thus accounting for "sourness" when oxides are suddenly heated, accidentally or otherwise. In event of oxide getting "sour" it should be taken out and exposed to air, when the disulphide will be slowly oxidized to ferrous sulphate, and, if then treated with an alkali, will be turned into ferrous hydrate, and ultimately ferric oxide in hydrated form. In working the purifiers the presence of a trace of ammonia in the gas may prevent oxide from souring—or, if partly soured, may bring it back to efficiency.

I would here present a sketch of the A. F. Kersting (Muncie, Ind.) system of laying out oxide for revivification.

The A. F. Kersting, Muncie, Ind., System of Laying Out Oxide for Revivifying.



This system practically does away with shoveling, reduces labor, and improves results by giving more intimate contact between air and oxide.

Just a few little hints at random, and I will close. When you cannot get good shavings, why not use coke "fines" for making oxide porous? Some little men in big plants have scorned the suggestion. Big men, in little plants, have taken a chance. Take, for instance, Mr. Lord, at Williamstown, Australia. He made phenomenal progress when he lightened his oxide in this way. Nearer home we have Mr. Murray, at Louisiana, Mo., who would not think of using anything but fine coke. He uses coke uniformly small and no piece larger than a hazel nut. This system is also used in Aberdeen, Scotland. Proportion: 1 oxide, 2 coke. Some years ago Mr. Jas. E. Kelley, of Stockton, Cal., reported fine results from the use of steam passed over the top of oxide in a purifier where air was being drawn down to revive the spent material. He used 4 boxes 14 by 14 by 3, and had a No. 1 Sturtevant blower connected by a 4-inch pipe to the underside of each. On the old plan it was the custom to raise the covers and revive at least 3 boxes daily. After using steam, as described, the boxes ran over 4 months without being opened. The theory is, the condensation that takes place put the oxide into just the right moistened condition, and thus aided its activity. If anybody here can give more detailed information on this subject, it would assuredly be very helpful.

Discussion.

The President—I am sure we appreciate the task placed on Mr. Little in asking him to abstract his paper, but I hope the discussion will be complete.

Mr. Schnerr—Being new in the gas business, I would like to ask Mr. Little a few questions. His paper deals with gas purification in its broad phase, and I have heard of various new processes which were being applied in different places, but having been unable to get any definite information I would like to secure some. What is the modern practice in ammonia and cyanide purification? Will it pay for the purification itself? Can you give a more definite idea of the gradations of the temperature from the generators or the retorts to the holder? That includes the condensers, scrubbers and purifiers. What is the most successful method of placing the oxide in the purifier; heavy layers or a greater number of layers, and make them lighter? What is the prospect of water gas purification paying for itself by the recovery of waste products? We know there is much sulphur in the discarded material. Is there any prospect in the near future of recovering that sulphur? And at what temperature is it most efficient in the ordinary purifier? In some places in his paper I have noticed 50°. An English authority gives us 140°. Then we have something on anhydrous oxide. Mr. Little, I believe, is inclined to the opinion that anhydrous oxide is efficient. I have had the pleasure of conducting several tests with hydrated oxide as compared with roasted oxide. The latter will take out hydrogen sulphide, for there is always a certain amount of moisture present in the gas, unless it is dehydrated before entering the purifier. The roasted oxide (it might be called dry, but not anhydrous) will take up water and thus become a hydrated product. If Mr. Little has had any experience along these lines I should like to have him give it to us.

Mr. Russell—On Page 5, Mr. Little says the boxes are put in the order 1, 2, 3 and 4 and then 4, 1, 2 and 3; that is, the cleanest box is put on first, and so through the rotation until completed. In Springfield we are doing something similar, save that we put the dirty box on last. That is the rotation, 1, 2, 3, 4; then box No. 1, which has become foul, is placed last so the order becomes 2, 3, 4, 1. I would like to know why the preference and on what it is based. As to keeping track of the material I found it interesting to trace the use of oxide. Before we rotate the series a test is made at the outlet of each box, and in the middle period we take it again. It often shows very interesting figures as to the amount of work done by the first box, which is always the greatest. We have a box entirely out of doors the temperature of which as well as that of the gas leaving it gets to the atmospheric state, which has been as low as zero, yet at that low temperature the box on first seems to do most of the work.

Mr. A. S. B. Little—Referring to Mr. Schnerr's reference to the title, I didn't select it. The Association did. We have had many reports concerning new systems of removing H_2S and other sulphur compounds, but so far I have not been able to get definite information on them. I looked this matter up very carefully, especially the Feld's system, which is a wet washer process, and the Burkheiser, one in which the oxide when used is practically red hot. When using the oxide in that way it is very efficient and shows that hydrated oxide is not the only kind that will remove H_2S. I was not giving my own views, but quoted from different papers so that you could in a way form your own opinion. Mr. Dewey reported that in Detroit he didn't find much falling off when the oxide had been sometime in use even when the temperature went down to about 30°. The temperature of 140° given by one of the papers I quote, does not refer to ordinary gas works methods, where such temperatures would

not be possible, and certainly not advisable, but I refer to it as showing that other trades and professions are interested in purification of gas. I tried to bring in some outside information which might start some of you thinking, and perhaps lead to some experiment or investigation. Regarding anhydrous oxide, I refer, of course, to the oxide when put in a box. I have used oxide that had been roasted to over 700°, and used within a few hours after it came from the roaster, so I don't think it could have picked up any moisture; but, of course, when put into the purifier it was sprinkled; that is, there was a whole lot of free moisture in the oxide when it was put in use. I don't know of any method of making anhydrous oxide hydrate. I think it might lead to the successful use of roasted fouled oxide; that is, if you could use your old oxide, and, after it was fully foul, to roast it enough, you might be able to use it in the purifiers again. In regard to anhydrous oxide I have never seen it used alone. We treated it with an alkali before it would hold. Just why that is I don't know, but it is an actual experience, not a theory. It would pick up some sulphur when not treated, and it had to be treated to become really efficient. Respecting changing the order of the boxes, I have tried to determine just why certain systems should be preferred and failed in the study. In England they work according to the system given. In Germany they work on the other system entirely. In the States they sometimes work one and sometimes the other.

Mr. Schnerr—I wish to call attention to an experience of mine with hydrated oxide. The oxide that Mr. Little used I believe is hydrous when put back, moisture goes with the incoming gas and the iron oxide hydrates; it may not be specially active as soon as replaced in box, but though it were roasted and carried to 700°, which should break up the water of hydration present, it will again take up water when exposed to moisture, therefore, I maintain that anhydrous oxide, to remove H_2S, must become hydrated before action will begin.

The President announced that the morning order had been completed. He then announced the following

COMMITTEE ON RESOLUTIONS.

Messrs. J. H. Eustace, D. McAfee and W. E. Steinwedell.

An adjournment until 2 P.M. was ordered.

FIRST DAY—AFTERNOON SESSION.

The President called the session to order, and announced that the preface to the programme would be a few

REMARKS BY MR. MOREHEAD,

as to the proposed Gas Congress in San Francisco.

Mr. Morehead—It has been arranged to have a Gas Congress in San Francisco, Cal., 2 years from now in connection with the Panama Exposition. The desire is to have a body which will represent all the Gas Associations in the United States. The American Gas Institute, having undertaken to see that that is gotten together, has appointed a committee to present these invitations to the different Associations. The membership of the committee is a guaranty of the standing which this Gas Congress has. Mr. W. R. Addicks, of the New York Consolidated Gas Company, is President; Mr. Jno. A. Britton, of the Pacific Coast Gas Association; Mr. Walton Clark, of the U. G. I.; Mr. E. G. Cowdery, of the Peoples Company, of Chicago; Mr. C. L. Holman, of the Laclede Company, of St. Louis; Mr. Robert M. Searle, of the Rochester (N. Y.) Company; and Mr. W. A. Wood, of the Boston (Mass.) Company, are to look after it for the American Gas Institute. Mr. Jones has sent the invitation to this Association. There are in the United States 23 Gas Associations, and it might be of interest to name some of them. These are: The Society of Gas Lighting, N. Y.; the Empire State; the semi-social organization called the "Gas Meeters'" the Guild of Gas Managers, of New England; the Illuminating Engineering Society; the Indiana, Iowa, Kansas, Michigan, Missouri, National Commercial, Natural Gas, New England, New Jersey, Ohio, Oklahoma, Pacific Coast, Pennsylvania, Southern, Southwestern, Wisconsin and Acetylene Gas Associations. Invitations have been presented to each of these Associations, at their annual conventions. The Empire State, the Guild, the Illuminating Engineering, and the Indiana Associations have accepted and appointed delegates. We ask that this Association take some action and, if it is favorable, that you appoint a delegate to confer with the committee from the Institute, Our object is to get every organization represented so that, by virtue of our numbers, by the prestige of the people we represent, and the size of our business, we will be able o get matters in such shape that, when anything comes up which affects one part of the country the entire country will have the benefit of it. As the representative of the American Gas Institute, of which I have the honor to be a Vice-President, and as the representative of the Committee on Gas Congress, I want to present this invitation formally, and as a gas man I want to say that I would like to see the Association accept it.

Mr. Pratt moved that the Secretary be directed to accept this invitation, and that the President be authorized to appoint a delegate to represent the Association. [Seconded and carried.]

The President—We will now take up the

REPORT OF THE COMMITTEE ON ACCIDENTS.

This was presented by Mr. L. H. Johnson, who prefaced it by remarking that the Committee had obtained 100 copies of a book entitled, "The Prevention of Accidents," issued at the instance of the Fidelity and Casualty Company, to be distributed amongst the members.

The work of this Committee has been aimed to suggest means of reducing the number of accidents both to consumers and to employees. The prevention of accidents has become a question of very vital importance to all industries. They have been brought to a greater realization of their duty by recent legislation bearing upon this subject. The laws governing injuries to persons and properties of the public are unchanged, but the laws with regard to the relation of employer and employee have been very materially changed in Illinois, within the past few years. A very stringent law was put upon the statute book in 1910, providing for the health, safety and comfort of employees, commonly called the "Factory Act." This was followed by the "Workmen's Compensation Law," which went into effect in 1912. Under the Factory Act an employer must safeguard "all belt-driven machinery; all projecting setscrews on moving parts; all drums, cogs, gearing, belting, shafting, etc.; all laundry machinery, mill-gearing and machinery of every description; all systems of electrical wiring or transmission; all dynamos, electric apparatus and appliances; all vats or pans and all receptacles containing molten metal or hot or corrosive fluid." And the law also provides that all dangerous places in or about mercantile establishments, factories, mills or workshops shall be properly enclosed, fenced or otherwise guarded; and it further provides that all factories, mercantile establishments, etc., shall be kept free from gas effluvia. That all poisonous or noxious fumes or gases arising from any process and all dust injurious to the health of the persons employed, shall be removed by either ventilator or exhauster devices; and there are provisions as to the cubic feet of air space for each person employed, fire escapes to be provided, doors opening outwardly, handrails on stairways, proper light near main passageways, and requirements as to floors not being overloaded, and to the width of passageways. Strict observance of the rules, as laid down in this statute, is very important, and the Committee wishes to call attention to the fact that the so-called "Workmen's Compensation Act" does not supersede or take the place of the "Factory Act."

Under the Compensation Act employers can elect to come within the provisions of the law and pay compensation, as provided therein, or reject the provisions of the law. Where the employer does not pay the compensation, he waives the common law defences of "assumed risk and fellow servants," and, in effect, waives the defence of contributory negligence, in that the Act provides for the return to the old "comparative negligence" idea, which is that, if the employee be injured and if he were less negligent than the master, the master is liable. Where, however, the employer elects to pay the compensation there is an absolute liability to pay an injured employee half time for a period of more than 6 working days. If you fail to comply with the Factory Act an employee is at liberty, under the Compensation Law, to sue under the Factory Act. Bearing all this in mind it is of the utmost importance that every precaution be taken to avoid injury to employees, and it would seem of great importance that every manager and superintendent of a gas company be thoroughly posted on the provisions of this law. They should also be familiar with the provisions of the Compensation Law, even though they are not operating under it. Good business policy dictates the making of careful reports of all accidents and the observance of many other rules of a similar nature, and keeping in close touch with an injured party between the time of injury and the final settlement of the case.

Beyond these reasons is the claim of common humanity; our duty to our fellow men. Every man of high principle must feel that he

(*Continued on page* 290.)

THE AMERICAN GAS LIGHT JOURNAL

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NEW YORK, MONDAY, MAY 5, 1913.

[Official Notice.]

Ninth Annual Meeting, Southwestern Electrical and Gas Association.

Office of the Secretary,
Slaughter Building,
Dallas, Tex., April 5, 1913.

To the Members: The Ninth Annual Convention of the Southwestern Electrical and Gas Association will be held at Galveston, Tex., May 21, 22, 23 and 24—a 4-day meeting, instead of 3 days, as heretofore, the Association having so increased in scope and numbers as to necessitate more time for its proceedings. In addition, it has been found necessary to have "parallel sessions" for the gas members and the accountants, these to "parallel" regular sessions which are on subjects not interesting to those attending the gas and accounting sessions. One full session will be given up, as heretofore, to the "Supply Men," who have promised that it shall not be the *least* interesting session of the Convention. This will be followed, in the evening, with a "Rejuvenation" of the Sons of Jove, at which the National Deities will preside.

A large attendance is expected from the East and North, two special cars having already been reserved, from St. Louis to Dallas, where it is expected to "hitch on" enough Texas delegates to make a solid "Convention train" from there to Galveston.

The official and definite programme, with list of papers and topics for discussion will be published in a short time. Full information as to railroad rates and routes, hotel accommodation, exhibits, etc., may be obtained by addressing the Secretary, as above.

Yours truly, H. S. Cooper, Secretary.

[Official Notice.]

Ninth Annual Meeting, Iowa District Gas Association.

Iowa District Gas Association,
Office of the Secretary,
Des Moines, Ia., April 7th, 1913.

To the Members: The Ninth Annual Meeting of the Iowa District Gas Association will be held in Burlington, Ia., May 7th, 8th and 9th. The headquarters of the Association will be at the Burlington Hotel. Early reservations should be made to secure the best accommodations. Mr. E. D. Clary, Superintendent Burlington Gas Light Company, Chairman of the Committee on Arrangements, will make reservations on request. The following papers are promised for the meeting:

"The Prepayment Meter" (an answer to Mr. Weisgerber's paper of the last meeting); by Mr. Thos. Crawford.

"The Welfare of the Employee," by Mr. G. W. Clabaugh.

"Operating a Store Room," by Mr. W. H. James.

"Recent Developments in Industrial Appliances," by Mr. E. C. Weisgerber.

"Advertising," by Mr. Fenton P. Kelsey.

"Improving Operating Conditions for the Small Works," by Mr. H. G. Stillson.

"Reducing Boiler Fuel in Water Gas Manufacturing," by Mr. T. B. Genay.

"Some Distribution Experiences," by Mr. W. H. Merritt.

Mr. E. G. Pratt will discuss the oil situation. In addition, the following Standing Committees will report: Manufacturing, Distribution, Construction, New Business, and Public Relations.

On May 8th, the convention will go by steamer, on the Mississippi, to Keokuk, returning the same evening. One session will be held on the boat. The afternoon will be spent inspecting the new dam and power plant. Other attractive entertainment features are being arranged.

G. I. Vincent, Secretary.

DEATH OF MR. JOHN A. COFFIN.

Again we are called upon to notify the fraternity of the death of one whose life's career was long and successfully devoted to furthering the advance of our industry. John A. Coffin, for years Superintendent of the Gloucester (Mass.) Gas Light Company, ex-President of the New England Association of Gas Engineers, a Charter Member of the American Gas Institute, and, if we mistake not, on the original roll of the Guild of Gas Managers, died at his home (No. 39 Beacon street, Gloucester) the morning of the 26th ult. He was in his 60th year, having been born in Nantucket, Mass., June 24th, 1853. In passing, it is worthy of note here that the father of deceased was first Superintendent of the Nantucket Gas Company's plant (formed when the subject of this sketch was turning his first year), when that seaport was known the world over as the greatest point of arriving and departing vessels concerned in the commerce of the whaler. However, as this is only the preliminary notice of the death of this most estimable and lovable of men, it may here be noted that the remains were interred in Nantucket, after appropriate requiem services in his late Gloucester home. He is survived by his wife (nee Miss Hussey), two daughters, and a son. The latter (Mr. William H. Coffin) about 2 years ago succeeded his father as Superintendent of the Gloucester Company, which property is now a factor in the control of the Massachusetts Lighting Company. Cultured, patient, lovable and loved man, the writer, who knew John A. Coffin for more than half his well lived life, would sorrowfully recall the beautiful hope expressed by the Romans over their honored dead, "*Sit tibi terra levis!*"

BRIEFLY TOLD.

The New Jersey State Public Utilities Commission Lays Down the Law.—"B. P. R.," writing from Bridgeton, N. J., under date of the 26th April, says: "Fearing that you have overlooked the final decision of the New Jersey State Public Utilities Commission, in the case of the proposed opposition gas enterprise for Millville, N. J., and knowing how important that decision is to every gas and electric interest in this State, I venture to send you the following bearing thereon: Standing by the prior decision handed down in the Atlantic Highlands case, the Commission has declared that the Consumers' Gas Company may not pipe the streets of Millville for a gas supply, in that the district is now being satisfactorily supplied by the old Millville Company. The projectors of the Consumers' Gas Company were granted a franchise for the district in 1912, and then applied to the Commission for permission to go ahead. Naturally, the Millville Gas Company's people objected to the grant, and an expensive legal contest ensued. The attorneys for the invading force urged that the customers of the old Company were dissatisfied with the quality of gas supplied, the price for same, the disregard respecting claims for main extensions, the inadequacy of its existing main system, the inattention to complaints, lack of pressure, etc. The Commissioners listened carefully to the pleadings, heard patiently the defence of the old Company, and then delegated a gas expert of undoubted ability and national reputation to inquire practically into the actual standing of the case. The expert's verdict sustained the old Company at all points, and the Commission concurred. All through this section right-thinking people are with the Commissioners."

April Meeting, Philadelphia Section, "Gas Meeters."—The April session of the Philadelphia Section, "The Gas Meeters," held Friday the 25th ult., afforded an opportunity to obtain a first hand knowledge of modern mantle and lamp manufacture as practiced by the Welsbach Company. The 70 "Meeters" gathered at Chestnut street wharf, at 2 P.M., and crossed the river to the waiting special trolley, bound for Gloucester, N. J. Arriving there the visitors were divided into squads of 5 or 6, under competent guides, and taken for a 2½ hours' exhaustive, but not exhausting, trip through the plant. This is a plant, because it has large grass plots and beautiful flower beds; it would be a factory if it had just plain open spaces, and if these were all sand it would, of course, be only a foundry. We were enabled to follow the woven fabric, from the knitting machines, through the impregnating and drying, forming and mounting, hardening and burning-off, dipping and boxing; besides seeing the printing and forming of the containers. In the lamp departments were the brass foundry, machine shops, spinning room, and assembling and testing rooms, etc. Outlying buildings are devoted to the making of collodion, and housing the infirmary, which is a fully equipped emergency hospital with a graduate trained nurse in charge. This latter is a very necessary adjunct, where as many as 1,000 to 1,200 women are employed. After this very enlightening trip, the "Meeters" again took the trolley, *en route* to Washington Park, a few miles further down the Delaware, where, at 6:30, a fine shad dinner was served. Afterward we saw by lantern light the shad nets hauled and some fine fish taken. The address of the evening, by Mr. H. F. Miner, Chief Chemist of the Welsbach Company, was on the "Development of Incandescent Lighting." The Doctor spoke of the work and successes of Dr. Auer von Welsbach, and of the efforts of some other investigators in similar paths. He did not, however, as he

might have done, mention his own research work, as a 20-year laborer along these lines. A few others were called upon by Chairman Dutton, amongst whom were Messrs. L. H. Bigelow, S. K. Campbell, Louis Stotz, Secretary of the National Commercial Gas Association; Mr. Lyon, of the Welsbach Company; Mr. W. J. McCorkindale, Mr. A. P. Brill and Mr. J. B. Myers. At about 9:30 the party started back to Philadelphia, and disbanded at the point of previously assembling.—C.

APRIL MEETING, PHILADELPHIA SECTION, ILLUMINATING ENGINEERING SOCIETY.—The April meeting of the Philadelphia Section, Illuminating Engineering Society, was held the 23d ult., in the Parkway Building, corner Broad and Cherry streets. This meeting was a joint session with the Philadelphia Gas Works Section of the National Commercial Gas Association and the Philadelphia Electric Company's Section of the National Electric Light Association. Preceding the meeting a dinner was served at Hauseman's restaurant, at which 67 members and guests were present. The meeting was called to order, with Messrs. Elcock, Rowland and Dyre presiding, and about 200 were present at the meeting. A very interesting exhibition of both gas and electrical industrial units had been prepared, Mr. Lee demonstrating the gas exhibition, consisting of both small and large units. Mr. Hazelton, of the Adams-Bagnall Company, demonstrated the electric units, and also showed a new type of regenerative arc lamp. Mr. Thomas N. Rolph, of the Holophane Works of the General Electric Company, presented a paper on "Metal Reflectors for Industrial Lighting." His paper in brief was as follows: The progress of industrial lighting has, until now, followed the progress of lighting in general; but, due to the great improvement of reflectors for industrial lighting, one may expect great advances to be made in this field. The proper lighting of factories can be shown to affect profits. The proper redirection of light, by means of reflectors, is essential to good lighting. Metal reflectors may be classified according to material, character of reflection, shape and distribution of light. The material most widely used is steel. From steel reflectors we obtain specular, spread and diffuse reflection. Specular or regular reflection is obtained from any smooth, opaque surface, such as a mirror or polished metal. A metal surface produces spread reflection; an aluminum finish is the most common. Diffuse reflection is obtained from reflection of light rays from particles beneath the surface. The most widely used surface is porcelain enamel. In shape there are four classes of reflectors: Deep bowl, shallow bowl, shallow and angle. The deep bowl and angle reflectors, of course, protect the eyes from exposure to brilliant lamp filaments; the shallow bowl and shallow reflectors, however, give a distributing type of curve and are, therefore, useful. Distribution of light is the most useful method by which reflectors can be classified. The distributions are extensive, intensive and focusing. The prototype curves of these distributions are calculated on the basis of obtaining uniform illumination when the light units are arranged in squares with the distance apart bearing a definite ratio to the height above the plane of illumination. The ratios of distance apart to height are 2 for extensive, 1¼ for intensive and ¾ for focusing distributions. Large warehouses and stockrooms should be lighted with distributing reflectors, as the exposure of the lamp filament is here permissible. These, of course, do not give uniform illumination. To obtain this focusing, extensive or intensive regulators should be used. Angle reflectors are used principally for local lighting, such as benches or particular portions of work on machines. For small sizes the greatest candle power values should be obtained between 15° and 45° from the vertical. For larger sizes, the candle power values should be between 35° and 80° from the vertical. In the intelligent selection of reflectors for a given installation, the following points should be considered: First, eye protection; second, distribution of light; third, efficiency; fourth, depreciation; fifth, cost. From the standpoint of eye protection, the most desirable reflector is the deep bowl, porcelain enamel finish, while the least desirable are the shallow bowl and shallow types of reflectors. In comparing reflectors on basis of efficiency, it is important to consider efficiency in the sense of illumination obtained for energy expended. The actual efficiency obtained from a reflector depends on its shape. In deep bowl types, aluminum is more efficient, while in shallow reflectors porcelain enamel is more efficient. To sum up: Aluminum finished reflectors are preferable to porcelain enamel, from standpoint of variety of distribution obtainable, protection of eyes and low cost. Porcelain enamel reflectors are preferable to aluminum from standpoint of ease of cleaning and lack of depreciation. Deep bowl reflectors are preferable to shallow ones, from standpoint of protection of eyes and variety and usefulness of distribution available. Extensive, intensive and focusing reflectors are preferable to distributing reflectors for most cases. Use the distributing curve in warehouses, and material cost should usually be disregarded. In discussion Mr. Lee presented about 50 slides showing gas industrial lighting installations. Mr. Calvert showed a number of slides of bad electric installations, singling out the weak points. Messrs. Bond, Dickey, Rowland, Ely, Israel and Prof. Hoadley also took part in the discussion. It was stated that two points should be considered in an installation, appearance by day and also by night. Glass reflectors can be used to better advantage than metal, where there are light walls and ceilings. Mr. Ely thought that deep bowl reflectors gave the room a dark appearance. The meeting adjourned at 10:30 P.M.

THE CEMENT GUN.—This new apparatus for depositing or placing cement mortar has opened a broader field for concrete, because the material (commonly called "Gunite") has important distinctive properties. The mechanism consists essentially of an iron cylinder to contain the dry mixture of cement and sand, and an air blast which delivers the mixture through a hose to the point of application. At the discharge end of the hose is a duplex nozzle, which supplies water to the issuing stream of cement, and accomplishes its hydration at the moment of deposition. The distinctive properties of the mortar are due to this last action. In cement mixtures made by the ordinary methods of gauging a certain proportion of the fine cement particles take their initial set before the whole mass is finally in the forms, and these portions, in setting prematurely, weaken the bond between the parts of the mass. When "gun" deposited the material is not disturbed at all after the addition of the water, and the full strength of the set mixture is obtained. Another point of superiority is the compacting of the material and squeezing out of excess water by the velocity of its discharge from the nozzle; and it is found that the first particles of sand rebound until a deposit of cement is formed sufficient to cushion and hold the sand, thus leaving on the surface treated a layer of neat cement under the mortar. These features are shown by the fact that a ton of hand placed cement mortar will cover 25 square yards of surface, while but 14 yards can be covered to the same depth by a ton placed with a "Gun." Actual tests on mortars show decided superiority of this machine over the hand mixed. For instance, 25 per cent. or more increase in tensile strength; even larger increase in compressive strength; about half as much permeability to water; less than half as much absorption of water; percentage of voids, less than one-half; adhesion to treated surface about 30 per cent. better. From the above it will be seen that this method of applying is particularly good for lining tanks, either old or new, for coating structural iron, for repairs to stone or brick structures and for surfacing concrete structures.

CURRENT MENTION—

MR. W. A. P. MCDONALD, Vice President, St. Joseph (Mo.) Gas Company, is acting temporarily as General Manager of the corporation, vice the late Mr. Kerr Murray Mitchell. It is thought the designation will be made permanent.

MR. WILLIAM W. RANDOLPH, M.E., has removed his offices to the "Woolworth Building," 233 Broadway, N. Y. He is safely and comfortably housed in Suite No. 1708, where he is ready, as he plainly declares, to continue his consulting engineering practice in matters relating to gas, electric light, railway and power properties.

CANADIAN Letters Patent were recently granted to Mr. Alten S. Miller, of Humphrys & Miller, of New York, for a special lining to tunnels used for conveying water. This type of lining is calculated to greatly reduce the cost of tunnel construction, as well as to reduce friction of the flow of water in such tunnels. The principle of the invention is the using of a thin lining, allowing the water to rest behind the lining, which, therefore, need have only slight strength, although at the same time the lining enables the water to travel in flow with a minimum of friction.

ANOTHER patent recently issued to Mr. Miller, is for a specially prepared packing for joints to cast iron pipe, the use of which plan should reduce the cost materially of laying hub-and-spigot pipes. It also should reduce gas leakage.

ON the 1st inst. these flat rates superseded the former gross and net rates charged by the Spokane (Wash.) Gas Company: Under 9,000 cubic feet per month, $1.50 per 1,000; 9,000 to 22,000, $1 per 1,000; 22,000 to 50,000, ninety cents; in excess of 50,000, eighty cents.

THE ordinance under which the residents of Venice, Cal., have been getting gas at 60 cents per 1,000 cubic feet has been repealed, and the former $1 rate has been restored.

MR. GEORGE LOCKE, formerly connected with the Denver (Col.) Gas and Electric Light Company, has signed a contract to act as Commercial Manager of the Honolulu Gas and Electric Company, Honolulu, Hawaii. Manager Strong has of a verity secured a good man.

(*Continued from page* 287.)

is, to the limit of his power, responsible for the safety and welfare of those about him. In the rush of business this duty has often been overlooked; but in the last few years there has been an awakening, and a great amount of work has been done to eliminate accidents. The work done by the safety committees of the railroads, and the safety departments of the steel companies, has shown marked results. The gas industry, which is the third largest industry, has been somewhat behind, and your Committee recommends that steps be taken to promote such work. As a result of the questions which were sent out last year your Committee has compiled a set of suggestions which it believes may assist you in the prevention of some of the commoner accidents, and these rules are given in the order suggested by the questions.

Works.

Yard.—Coal, coke, pipe, etc., when piled, should never be undermined; it should be kept trimmed and no loose planking allowed on top of pile. All travelling cranes, etc., should be provided with a warning bell or whistle, and warning notices posted within the zone of its operation. All runways on which coal, coke or other material is wheeled should be kept clean and in good repair. When cars are being unloaded a danger signal should be displayed. The Chicago and Northwestern Railroad Rules and Regulations say, "A blue flag by day and a blue light by night, displayed at one or both ends of an engine, car or train indicate that workmen are under or about it." Employees should be prohibited from riding on conveyors or on freight elevators where it is not absolutely necessary. Drip risers, valve boxes, etc., should be flush with the ground or protected.

Boiler Room.—In using steam flue cleaners, the cleaners should be made with a long nozzle and an approved form of coupling for fastening the hose.

Steam valves between boilers should be closed and locked when boiler is not in use. This rule should also apply to valves on condensers, scrubbers, purifying boxes, etc. The man who locks the valve should be responsible for same, and he alone should unlock it when he is sure that no one is inside the apparatus.

Generator or Retort House.—All seals, tar walls, etc., should be enclosed by railings. Blast mains on water gas sets should be protected, either by an interlocking device or by some adequate venting device which will operate during the run. Floor plates should be made of steel. All cinders taken from machines or benches should be promptly quenched. All stairways and passageways should be lighted, and in passageways where the ceiling is low there should be "low bridge" warnings. All cleaning and clinkering bars, rakes, etc., should be kept in racks. Employees should be instructed to wear gloves when doing work where they are liable to be burned by hot tar, etc. In cleaning water gas machines, opening the cleaning doors should not be dependent upon such a signal as rapping on the floor or whistling. Some positive signal should be used. Cotter bars of manhole covers should not be held by pins but by straps.

Other Works' Buildings.—The edges of all elevated platforms or floors should be guarded to prevent tools, material, etc., from falling over the edges. All windows which are near floor level should be guarded.

Holder.—Steam jets to holder cups should be short, to prevent siphoning below a safe level, and vertical check valves should be installed in the steam risers.

Shops.—All emery wheels should be guarded and should be run only at rated speed. Goggles should be worn by men working on lathes. Workmen should be cautioned against leaving boards, etc., with nails sticking up in them. This is the cause of frequent and serious accidents. All circular or band saws should be guarded. In the meter shops, and wherever soldering is done, warning should be posted of the dangers of lead poisoning. Men cleaning windows on floors above the ground level should use life belts. As far as possible men should not be allowed to work one above the other where there is any danger of dropping anything on the man below. In cleaning valves or tar apparatus fire should not be employed. Stationary lead kettles should be provided for use where necessary. Acids, pentane, gasoline, oils, paints, etc., should be kept in some safe place especially provided. Workmen should be warned against leaving tools on the top of stepladders.

Street.

Mains.—Have an inspector on all work done by outside contractors. Instruct foreman to keep people as far away from the work as possible. In cutting a main which carries electric current a bond should be run before the cut is made. This is to prevent gas which escapes from being ignited by sparks. Ditches should be inspected frequently after refilling, until there is no danger of further settling. After all excavations, dirt, snow or ice should be leveled off. In ditching in the street, workmen should not cut large roots of trees. All ditches should be barricaded. Barricades should be carefully made, and no rough end should project which might tear the clothing of persons passing. The handling of the lead kettle, pipe, etc., should be done by experienced men. Men cutting cast iron pipe or pouring lead joints should be required to wear goggles. Street workmen should take no chances on any questionable ditch, but should sheath it. All loose material should be kept back from the edge of the ditch.

Services.—Before running a service into a new house the owner should be consulted as to the arrangement of the cellar, and the matter should then be taken up with the plumber before the housepiping is done. Vent caps should be used on the end of all vents from high pressure installations. Notices should be attached to regulators warning people against closing the vent. A man should never be allowed to work alone where there is any possibility of gas escaping. Employees should be prohibited from "flipping" wagons or autos.

Meters and Appliances.

Meter Setting.—In hauling pipe that projects beyond the end of the wagon, the end of the pipe should be wrapped with burlap, and some signal placed thereon to attract the attention of pedestrians. Meter readers should be instructed to report poor meter installations, and inspections should be made from time to-time as to the conditions of the meters themselves. When turning on meters which have been shut off the 2 foot dial should be watched carefully to see that there are no leaks.

Gas Stoves and Appliances.—All stoves and appliances should be inspected after they are installed and should be left in perfect working order. Consumers should be thoroughly instructed in the use of gas stoves or appliances after they have been installed. Flue pipes should always be used in installing water heaters. No appliance should be installed close to the meter, and, conversely, no meter should be set close to an appliance.

House Piping.—All house piping, whether done by the company or by a plumber, should be tested with a mercury gauge, and when meter is set fitters should observe the 2-foot dial carefully to see that there is no leak. In doing house piping work use flashlights as far as possible. If it is necessary to use a candle it should be used with a candlestick having a broad saucer. Pipe should never be run through chimneys or flues.

General.

1. Employees should be instructed to use extreme care at all times in all of their work.
2. Employees should be impressed with the fact that they must never take chances.
3. All employees should be fully instructed in the work which is expected of them.
4. Instruct employees to report all leaks, poor installations, or any other matters needing attention.
5. Employees should be instructed never to enter any premises without permission, and to use great care in leaving a place in the condition in which they found it, being careful to close all doors which were closed when they entered.
6. Both employees and the public should constantly be warned against using any open flame where there is any suspicion of a leak.
7. All tests for leaks should be made with soapsuds and smelling, never with matches.
8. Allow none but safety matches to be used by employees, and discourage the use of matches entirely except where unavoidable.
9. Frequent inspection should be made of all the tools used by employees, and the same should be kept in good repair.
10. All rigging, scaffolding and machinery should be inspected periodically.
11. No machinery should be overloaded.
12. There should be wire or sheet metal guards, or railing around all pulleys, engines, pumps, belting and moving parts.
13. Bolts and keys on all shafting, pulleys and couplings should be countersunk.
14. All elevators should be equipped with gates, and the shafts should be inclosed.
15. All iron, steel, brick or concrete floors should be kept clean and roughed to prevent men slipping.
16. Employees working around engines, pulleys or any moving machinery should be prohibited from wearing any loose flowing garments.

Of course there are many other rules and safeguards which might have been incorporated in this report, but it is the hope of the Committee that those enumerated above may help in reducing the number of preventable accidents. We hope that the members of the Association will add to this list, giving us all the benefit of their own experiences, for it is only through organization and systematic effort that the best results will be obtained.

Discussion.

Mr. Johnson—We have been very fortunate in securing Mr. R. J. Young to speak to us this afternoon on what has been done in the Illinois Steel Company. He is the Manager of the Department of Safety and Relief of that Company.

Mr. Young.—In the last part of Mr. Johnson's paper, where he remarks it is through organization and systematic effort that the best results can be obtained, he really stated the situation. The one big thing in the prevention of accidents is education. We have been prosecuting this accident prevention campaign for some 12 years. At first we depended largely on the guarding of machinery, but found that, although we could reduce our accidents in such way about 33⅓ per cent., if we were going to get the best results we would have to systematically organize and advertise the safety movement among the men. Practically 80 per cent. of the accidents occurring in any industry are due to carelessness. However, they must not forget that the education of the men depends almost entirely upon the managers, and if the men are to be taught to think of "safety first" that thought would have to be instilled in their minds by their superintendents. If the superintendent of a department treated accident prevention lightly his foremen will treat it lightly, and the men will reflect the same attitude. If, however, a superintendent makes accident prevention one of the important features of his department, then that feeling will be reflected by his assistants and they will see that the men observe the precautions which are known to be necessary. I propose to show you later the results of the work that we have done in the steel corporation, but you probably will be able to get some ideas from the plans shown and apply them with modifications to some of your work.

[Mr. Young then gave a very interesting illustrated description of the methods in vogue in his huge corporation, respecting its practices in respect of reducing to a minimum dangers leading to injuries to its workmen. He was generously applauded, and at its close, on motion of Mr. Pratt, a hearty vote of thanks was passed to him.—EDS.]

The President introduced Mr. F. F. Cauley, who read the following paper on

THE POSSIBILITIES OF GAS AS AN INDUSTRIAL FUEL.

We are living in an age of big business, and gas companies, like other progressive concerns, are striving to sell large quantities of their product. A great deal has been accomplished in gas lighting and in the field of domestic fuel, and there is no doubt that gas companies will continue to secure and hold much big business along these lines, but in addition to this comes the great opportunity in the sale of gas for industrial purposes.

There have been some good developments along this line, but many gas companies, not realizing the immense amount of business to be secured, have, therefore, failed to develop their opportunities. However, some having been more active, have succeeded in selling millions of feet of gas through industrial appliances. This fact should interest everyone, for we are all striving to sell more gas, and especially trying to secure the big business. It is gratifying to know that we have the opportunity at hand, if we would develop it. The purpose of this paper is to discuss the progress that has been made up to the present time, and to point out, or suggest, if possible, any improvements which will assist in securing a larger volume of this business.

The manufacturing field is a large one, but it was only within the last few years that any real progress has been made in the way of installing modern gas equipment to displace the antiquated coal furnace.

Manufacturers have been afraid to consider gas fuel. There seemed a sort of general feeling that gas would be too expensive, and, perhaps they were more or less justified when we consider their early experiences in trying to apply burners, etc., to their regular coal furnaces.

Under the new plan, where each heating problem is made a special study, and a furnace is designed and built to do work efficiently and economically, it is needless to say that real strides have been made. Some gas companies report they are selling over 100,000,000 cubic feet of gas annually through industrial appliances. This is certainly encouraging, and should act as an incentive to others who have not been active in promoting this work.

One of the most interesting features of this work is that we are almost daily finding new places to apply gas. Take the things we wear: Our hats, shoes, gloves and clothes are all treated with steam, and we have installed gas fired boilers to do all these operations. We are enthusiastic when we consider the number of places where gas can be applied. The introduction of gas fuel in the manufacturing field requires a first-class selling organization. We mean by this that men should be chosen who have mechanical knowledge, combined with good selling ability, and above all good judgment. The industrial salesman must go a little further than simply being familiar with a line of stock appliances. There are new problems to solve every day, for which reason he should have good mechanical ideas and know how to apply them.

The new industrial laboratories and salesrooms which have been opened up by several gas companies have proved of the greatest assistance to the salesman. In these salesrooms appliances are connected up and demonstrated under ordinary working conditions. Material is brought in by the manufacturer and tried out in the various appliances. The industrial laboratory serves another purpose. Having solved one heating problem for the manufacturer he is convinced that some real progress has been made, and it has put the salesman in a stronger position to talk about additional equipment. The laboratory also acts as a school for the selling organization, for tests and experimental work are going on nearly all the time.

I should like to say a few words regarding industrial appliances, as much of our success depends upon good equipment. There has been some development in these, by which is meant that stock appliances made by such manufacturers have been improved, and that a great many new appliances have been brought out to meet the demands for industrial gas equipment. From our experience we find the average furnace could be improved in the way of construction. Since heat is a destroying element, industrial appliances should be well constructed to withstand the excessive heats. A few dollars more spent in the construction of a furnace may greatly add to the life of the appliance, and the little additional cost would not prevent the sale. While some of the old principles are perhaps good, we believe there has not been as much improvement in industrial appliances as there should be.

We believe the opportunities for gas fuel justify considerable study with the idea of improving our present type of furnace. We have done considerable testing and experimental work which has been extremely interesting, and we believe it has developed some good. We have found that the use of atmospheric burners is more economical for some work, and, on the other hand, it would be impracticable to do some work without blast burners.

We have attempted to make some improvements in case hardening and annealing furnaces, as these furnaces are large and are generally operated 8 or 10 hours per day. After giving the matter some study, drawings were made and a furnace constructed on the down-draft and pre-heating plan. When completed it was sent to our industrial laboratory, where tests were made to determine the advantages and savings in fuel. I might mention here that the size of the furnace is 12 inches high, 24 inches wide and 30 inches deep. The burners were arranged along the sides, the chamber for heating the air being directly under the furnace. The furnace was arranged so that it could be operated, using the down-draft for pre-heating the air, or by using up-draft and not heating the air.

Tests were made on cold furnace, allowing 2 days between tests to completely cool the brickwork. Four runs were made lasting 5 hours each. A comparison of the tests, with cold and pre-heated air on fan blast, at 8 inches pressure, shows no saving on fuel for the first hour; by pre-heating, the second hour it showed a saving of 11 per cent.: the third hour a saving of 21.3; the fourth, a saving of 31.9; the fifth, a saving of 32.1. This means an average saving of fuel for the first 5 hours' run from cold, of 19.3 per cent., or a saving in a 10-hour run of 25.68 per cent. With air at 1¼ pounds we showed a saving by using hot air the first hour 11 per cent.; the second 11.5 the third, 17.3; the fourth, none; the fifth, a saving of 21.2. This means an average saving of fuel for the first 5 hours' run, from cold, of 12.2 per cent., or a saving in a 10-hour run of 16.7 per cent.

The amount of gas used in 10 hours (two 5-hour tests) with fan blast, was 2,811 cubic feet; and in 10 hours, with positive pressure, 3,099 feet, or a saving of 9.4 per cent. in favor of the fan. A tem-

perature of 1,500° F. was obtained and maintained as closely as possible during the tests.

With a little increase in the cost of construction a still further saving can be effected by reducing the loss by radiation, perhaps by using magnesia blocks outside of the brick lining. This loss now is considerable, especially on long runs and high temperatures. We have made some tests on these furnaces under 2,600° of heat, which is a higher heat than that obtainable in other furnaces.

We have also applied the principle of pre-heating the air to a specially constructed gas forge with excellent results. We have been able to weld large pieces of wrought iron and obtain temperatures above 3,000° F. The only difficulty experienced was with the forge linings, which went to pieces under such high temperature. We have tried several kinds of firebrick and fireclay compositions; but, up to the present time, we have not been able to find any material to stand such high temperatures. This test is one of many which we have conducted at our industrial laboratory. We expect to continue in this experimental work, for we believe much improvement can be made in industrial appliances.

With your permission, I will show you some slides of industrial installations in Chicago, and we trust that they may offer some suggestions which will assist you in promoting industrial work.

Mr. Cauley then showed 33 examples of working installations.

Plate 1.—This shows a 10 horse power, high pressure boiler, equipped with automatic gas and water feed control. The boiler shell (30 inches diameter and 60 inches high) has 48 one-inch steel tubes. The burners are controlled by a diaphragm valve, operated by the steam pressure in the boiler. The water is kept at a constant level in boiler by a small Worthington steam pump, which is operated automatic ally. The boiler is operated under 80 pounds steam pressure. The equipment is installed in a milk pasteurizing plant.

Plate 2.—Another type of high pressure steam boiler, known as the "Flash Boiler." They are generally operated under steam pressures between 70 and 80 pounds, are equipped with automatic gas and water feed control, and have been very satisfactory for doing steam jacket kettle work. This installation is made in a large barber's supply house for making barber's soap.

Plate 3.—This shows a 3-horse power, low pressure boiler, connected to steam coils which are inclosed in an oven. It is used in a piano factory for drying sounding boards.

Plate 4.—Picture of a 3-horse power, low pressure boiler, used on the seventh floor of a downtown office building. Fitted with automatic gas and water feed attachment, it is used for steaming cloth.

Plate 5.—This picture shows a row of coal furnaces in use in a tinfoil factory before installing gas equipment.

Plate 6.—This picture shows six 3,000 pounds blast metal, melting furnaces, which displaced the coal furnaces shown in previous picture.

Plate 7.—This shows a blast burner equipment applied to one 5-ton stereotype furnace.

Plate 8.—This shows 1,000 pounds zinc melting furnace, installed in a factory making women's hats, and is used for casting die blocks.

Plate 9.—This picture shows one of four lead melting furnaces, installed in a local car seal factory. You will note 6 girls work in a circle from 1 furnace.

Plate 10.—This shows two zinc furnaces. The rectangular furnace is used for galvanizing small metal parts. The appliances are installed in a large sheet metal factory.

Plate 11.—This picture shows a tinning outfit arranged as follows: The first pot (used for tin), 24 inches wide, deep and long. The second pot (used for tallow) is 36 inches long, 24 inches wide and 24 inches deep. The pots are welded steel, ⅜-inch thick, and are fitted with atmospheric burners. The walls of the furnace are insulated with 2 inches of asbestos. Four of these outfits, installed in a local factory, are used for tinning metal stampings.

Plate 12.—Here is shown the heat treating room in a large tool steel company in Chicago. Here we have several sizes of hardening furnaces, including cyanide, muffle and tempering furnaces.

Plate 13.—This typifies another large tempering furnace, installed in a local automobile repair shop, for tempering springs.

Plate 14.—Annealing furnaces, used for annealing brass and copper.

Plate 15.—This picture shows an ice cream cone factory, and 16 machines are in this installation. The burner equipment is operated with a fan blower.

Plate 16.—A movable forge, fitted with blast burners. It is used for straightening heavy Shelby steel tubes, the latter being 6 inches to 8 inches in diameter, the walls being 1 inch thick.

Plate 17.—This picture shows a cyanide hardening plant, such as generally used by engravers, including motor and blower, cyanide furnace and small annealing furnace.

Plate 18.—This shows a heat treatment plant, in which all kinds of hardening, tempering and annealing are carried on as a commercial business. The plant is equipped throughout with modern furnaces.

Plate 19.—This shows the case-hardening plant in a local machine shop, where gears exclusively (both cast iron and machine steel) are made.

Plate 20.—This shows two large china kilns, each of which is equipped with 4 specially powerful gas burners. Firing china with gas is used extensively throughout Chicago.

Plate 21.—This picture shows 3 indirect-heated wax furnaces. The flame from the burner is baffled so that no flame comes in contact with the steel kettle, and are installed in a factory manufacturing electrical devices.

Plate 22.—This shows a bottle drying oven, the idea being to evaporate the moisture on the inside of the bottles. The air is heated in a metal box directly above the burners, which is then drawn from the box by a suction fan and forced into two compartments, which have small ¼-inch tubes discharging the hot air into the neck of the bottles. The oven is 48 inches wide, 30 inches deep, and 8 feet high, and it has a capacity of 8,000 bottles per day. It is installed for a local importer who bottles olive oil.

Plate 23.—This picture shows a proportional meter outfit for mixing air and gas for heating hat blocks.

Plate 24.—A row of hat block machines, supplied with gas and air from proportional meters.

Plate 25.—This picture shows the interior of a couch and bed spring factory. You will note 3 gas forges, used continually for bending angle irons.

Plate 26.—A wagon tire heater, which is operated with a fan blower. The gas tire heater has practically displaced all other methods of heating tires.

Plate 27.—This picture was taken during the construction of a local crematory operated by gas. Three powerful gas burners are introduced into the upper compartment and one into the second chamber. The crematory was built on the down-draft principle, and has been in operation for about 2 years.

Plate 28.—This gives an exterior view of one of the retorts, showing the 3 small doors for lighting the burners; also various air pipes which are so necessary in the operation of the retort.

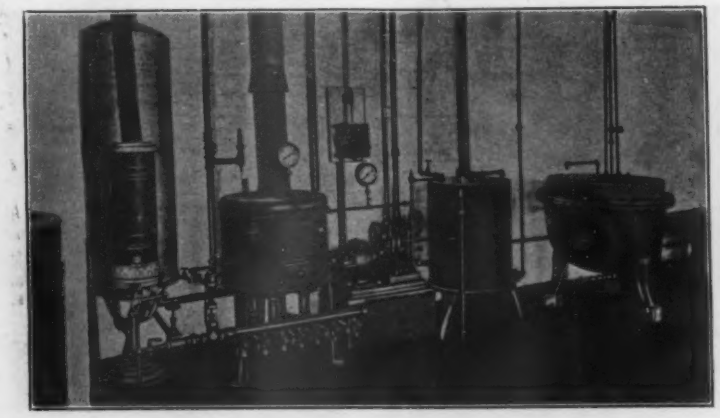
Plate 29.—This shows a large cocoa bean roaster. The cylinder (24 inches by 6 feet) has a capacity of 3 bags per hour. It is heated with blast burner equipment.

Plate 30.—This picture shows a large coffee roasting plant, fitted up complete, with blast burner equipment.

Plate 31.—This shows a large japanning oven installation, designed and built with special atmospheric burners. The ovens have double walls and top, and are well insulated with 1½ inches of cellular asbestos; also, arranged with partition-tile under ovens for air circulation. They are used for japanning high grade automobile lamps, steel stampings, etc.

Plate 32.—This is another large japanning oven, 24 feet by 10 feet. It is arranged with double doors in middle of the oven, which can be opened or closed as desired, and is used for japanning steel lockers, cabinets, doors, etc.

Plate 1.



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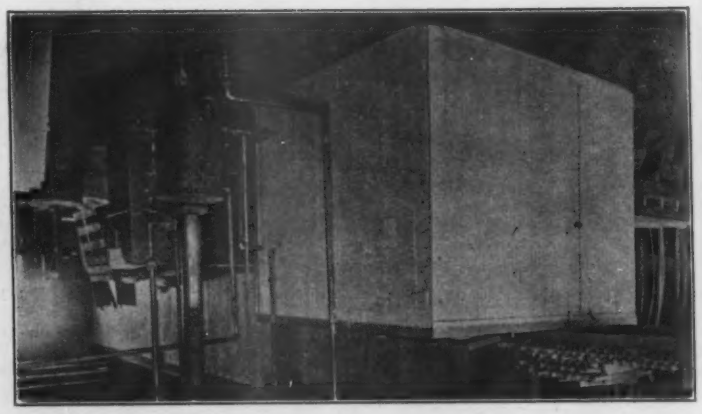

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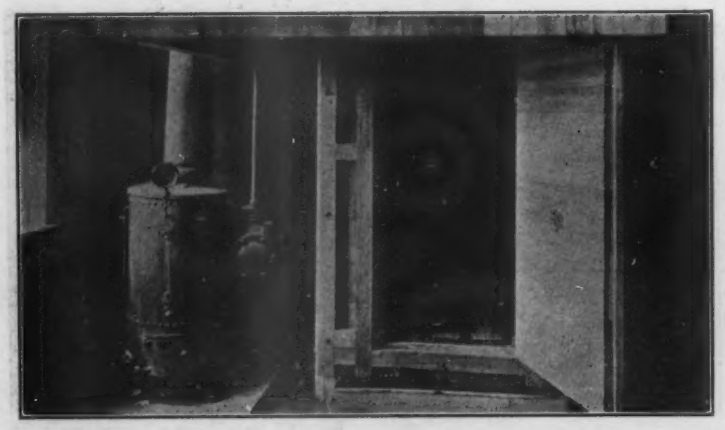
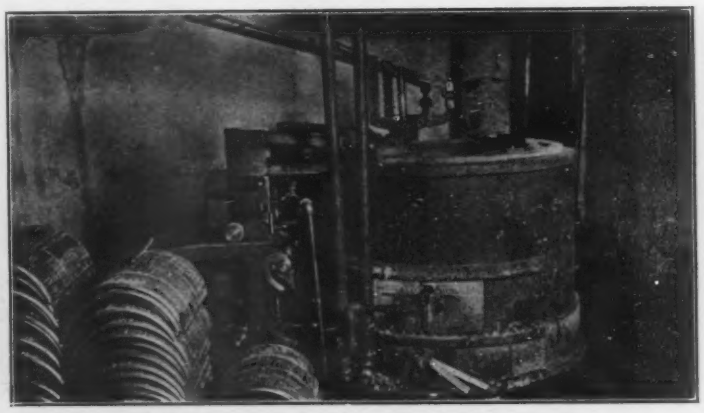


Plate 4.

Plate 5.

Plate 6.



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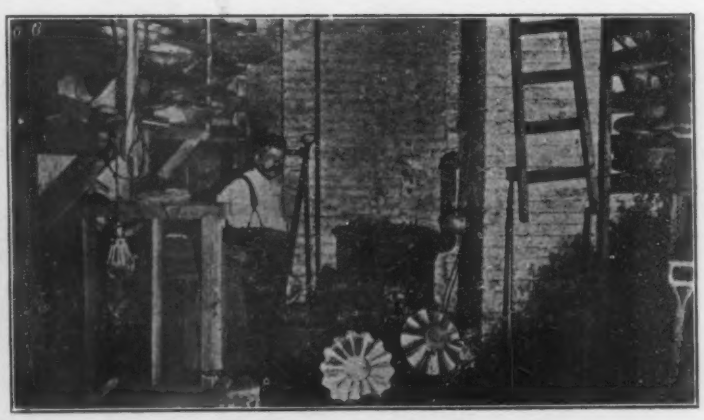

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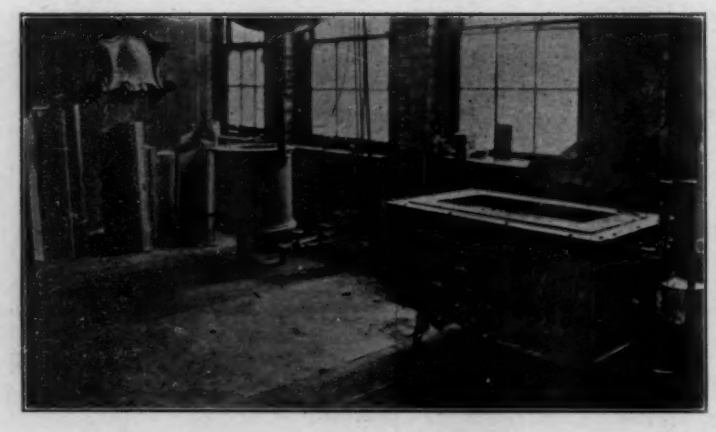
Plate 9.



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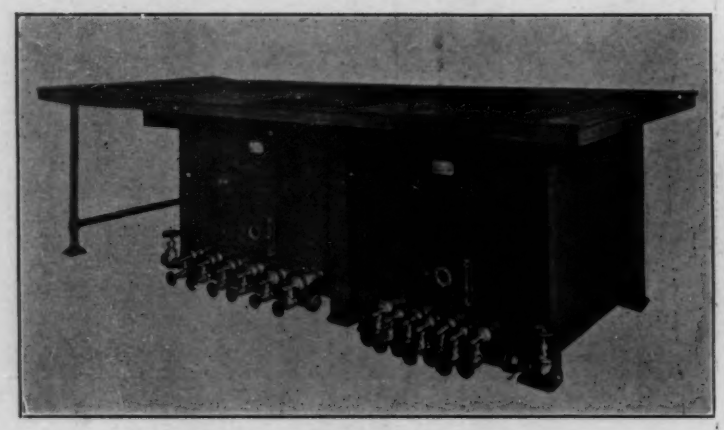

Plate 11.

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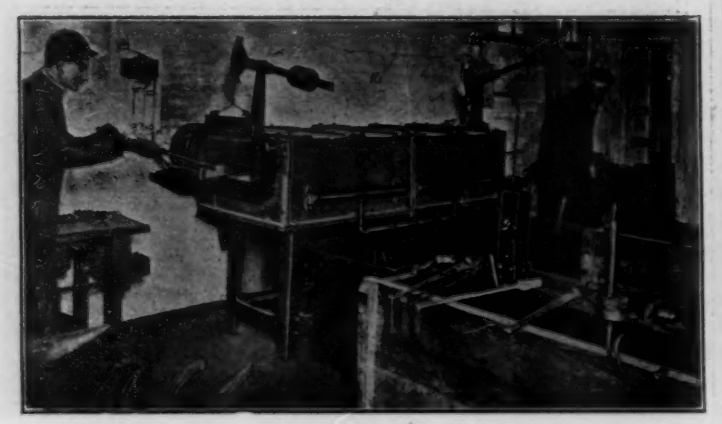

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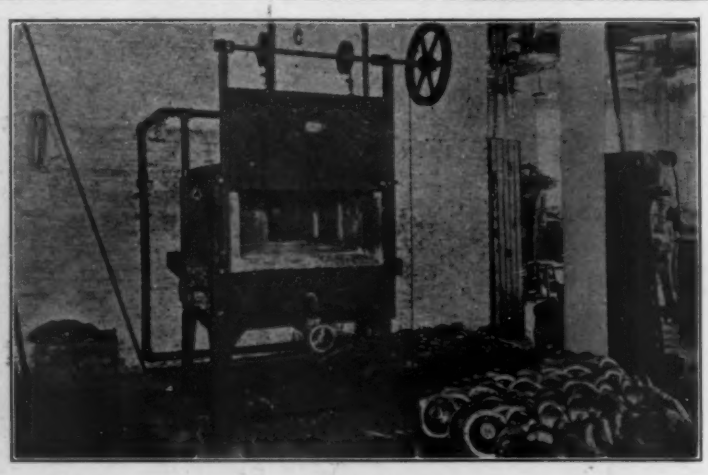


Plate 14.

Plate 15

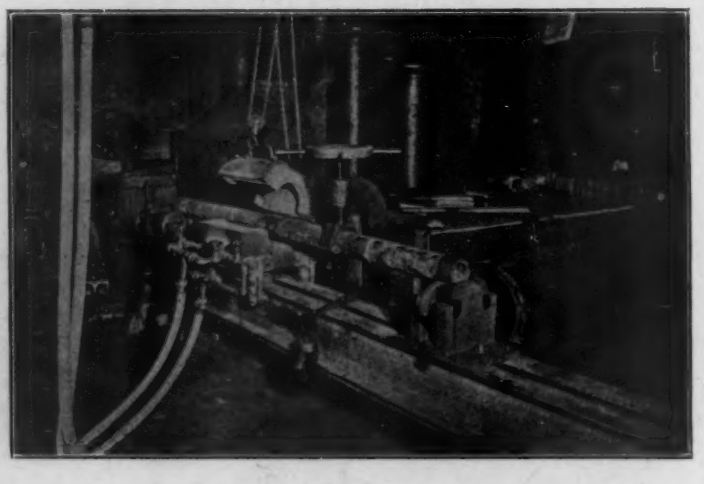


Plate 16.

Plate 17.

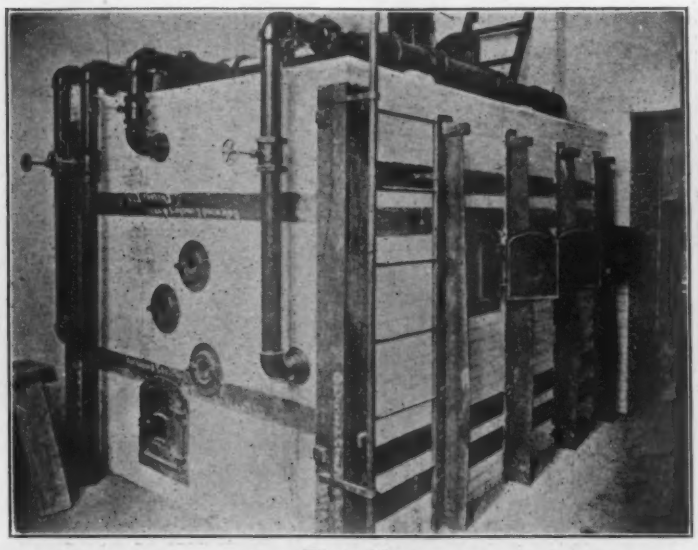
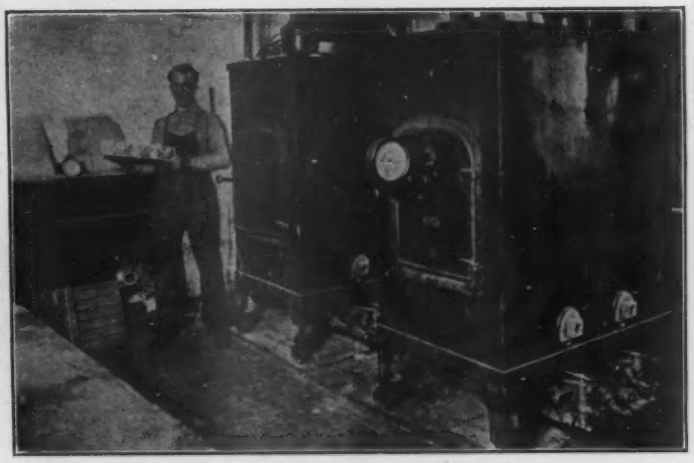


Plate 18.

Plate 19.



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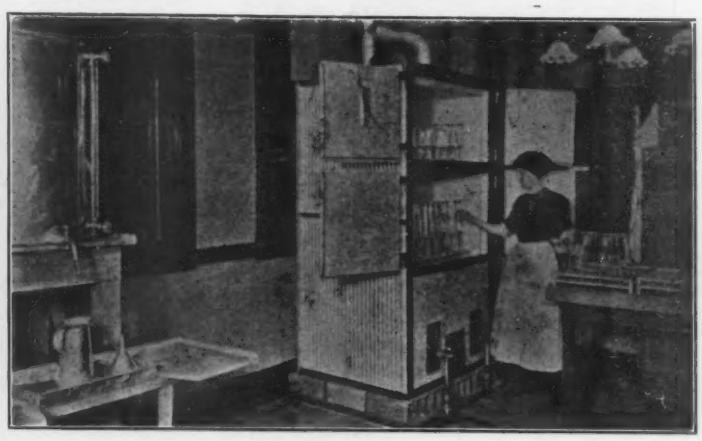

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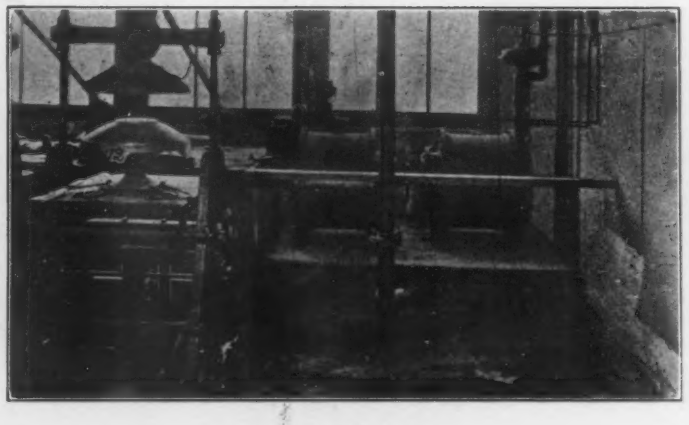

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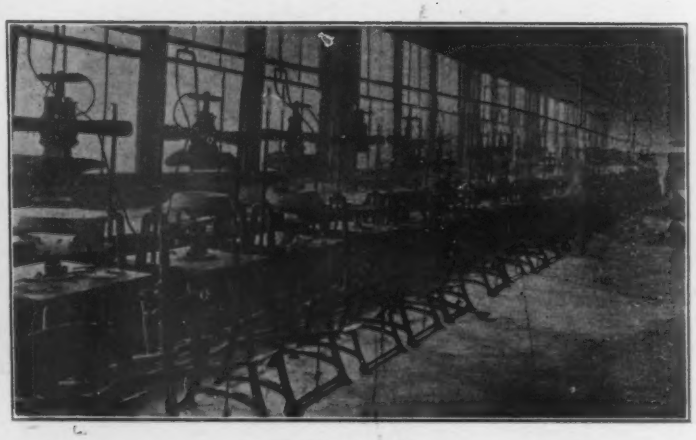

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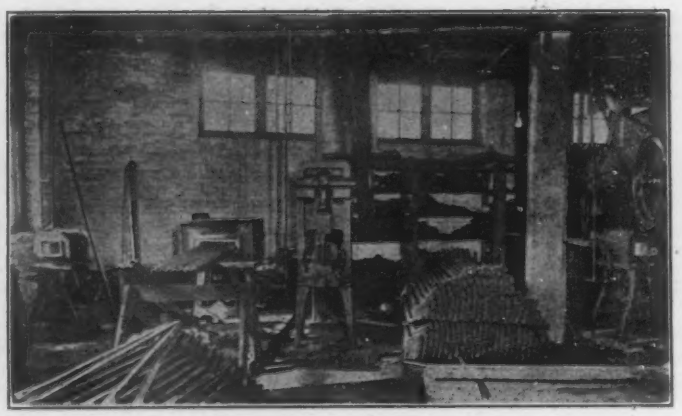

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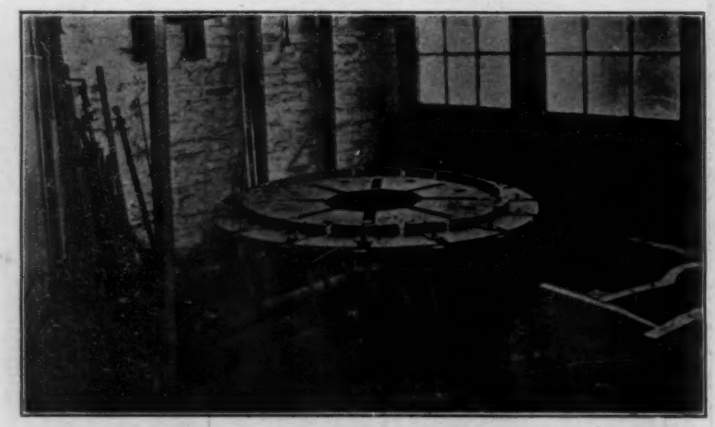

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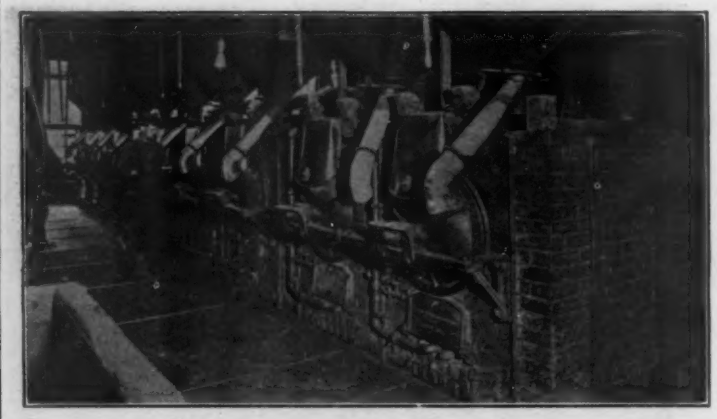
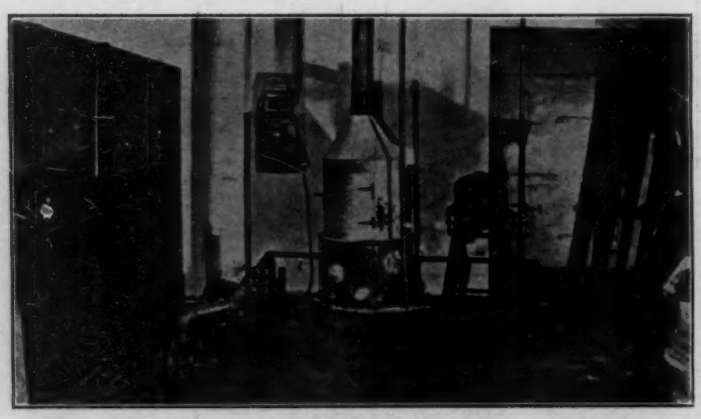


Plate 30.



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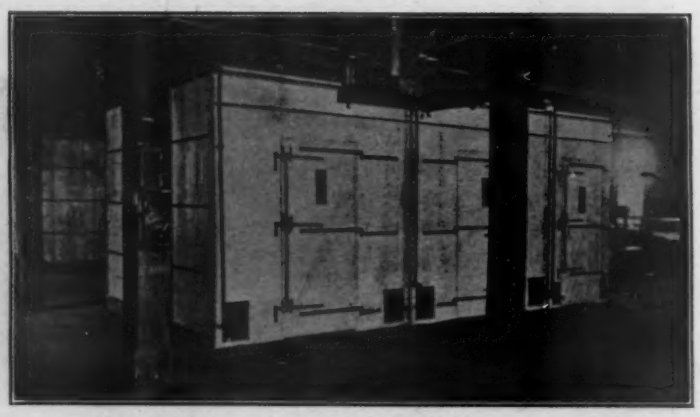


Plate 31.

Plate 28.

Plate 32.

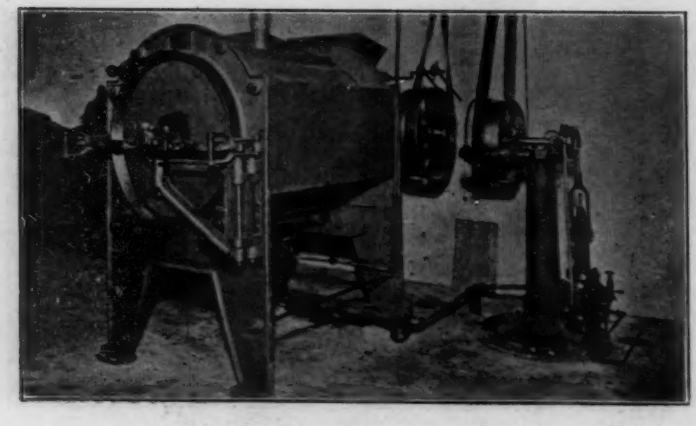


Plate 29.

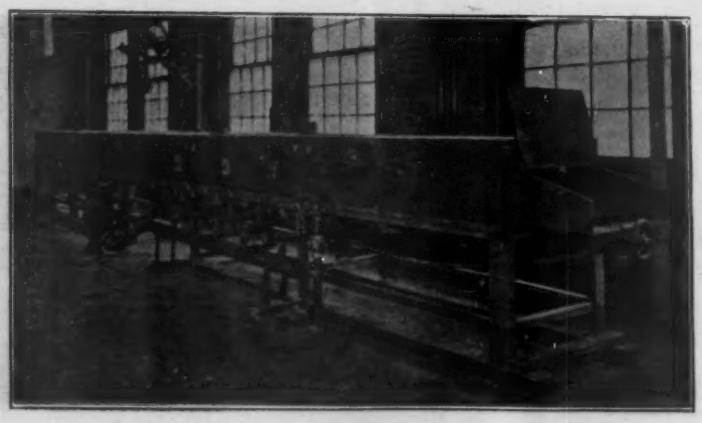


Plate 33.

Plate 33.—This picture shows a special heating machine for convexing glass. About 40 feet long, it is fitted with both atmospheric and blast burners.

Discussion.

The President—Does anyone wish to ask the author questions in respect of the paper.

Mr. Negley—Has Mr. Cauley any data on the cost per horse power hour?

Mr. Cauley—Regarding operating cost, will say that, on a test, we were able to evaporate 30 pounds of water with 80 cubic feet of gas, which means 80 feet per horse power.

Mr. Negley—What is the rate per 1,000 feet of gas?

Mr. Cauley—Eighty cents is the price for manufactured gas in Chicago. We also supply natural gas at 40 cents.

Mr. Fisher—I am much interested in the comparison between the results from fan blast and positive blower. I notice these experiments were taken on different days, and wonder whether any attempt was made to take the calorimetric value of the gas and the pressure for the air and gas on the different days.

Mr. Cauley—I notice that Mr. Zander is in the rear of the hall. Mr. Zander designed the furnace and supervised the tests at our industrial laboratory, and I will ask him to answer the question.

Mr. Zander—The tests were made 2 or 3 days apart. The calorimetric value of the gas was not taken.

Mr. Von Maur—I would like to ask how many cubic feet of gas it takes to roast a 132 pound bag of coffee? And, also, how many cubic feet of gas it takes to cremate a body?

Mr. Cauley—The average cost of roasting coffee, with natural gas at 40 cents per 1,000, is about 5½ cents per bag of 120 pounds. Regarding the gas consumed at the crematory, will say the average consumption is about 3,000 cubic feet for making one complete cremation.

Mr. Yonts—Where gas is used in japanning does the dry heat split the enamel and cause it to peel?

Mr. Cauley—Regarding the peeling and cracking of your japan, there are several things that might cause this trouble. In the first place your metal parts should be thoroughly cleaned before applying the japan; and secondly, when buying japan be sure to say just what class of work you are doing and what temperature you expect to bake it. Third, have a properly constructed oven. If you follow these suggestions you can turn out better work and more of it than with the best coal heated oven ever made.

Mr. Kerswig—Does that automatic device for regulating the air and gas maintain a constant relation between them?

Mr. Cauley—Yes.

The President announced a recess until 6:30, at which hour the banquet was to be served.

(To be Continued)

The Gas Man's Alphabet.

The "Poet Laureate" of the Southern Gas Association is undoubtedly Mr. James Ferrier, and presumably that was one (although a small one) of the many reasons that induced his fellow members at their last meeting to name him the chief executive of the Southern Gas Association. Believing, as we do, that genius should be heralded and that great merit should be extolled, we feel it our bounden duty to here reproduce this last alphabetical proof that genius and merit repose within Mr. Ferrier's mentality. So, here goes Mr. Ferrier's recently compiled "Alphabet" for gas men:

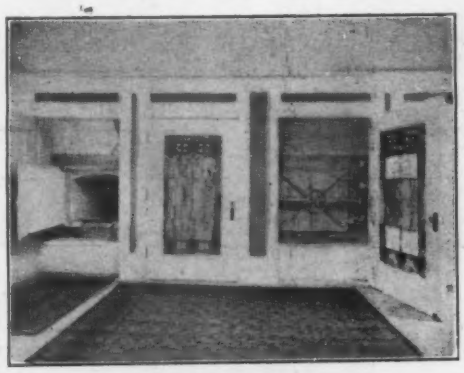
A for America, the Land of the Free.
B the Business we're in; you and me.
C's Corporation *sans* soul but with nerve,
D is its Duty the public to serve.
E's our Expenses; tiny and small.
F is the Franchise they say does it all.
G is our Gas, costing less than a cent.
H stands for Hell, to which we're all bent.
I is our Income, all profit, immense.
J is the "Justice" which some courts dispense.
K for the Kicks which come late and early,
L for the Laws that treat us so fairly.
M means our Meters, ninth power Ananias,
N is No Gas which they used just to try us.
O's Ought, franchise value when rates must be made,
P is its great Price when our tax must be paid.
Q is the Question—"Is what's ours our own?"
R the Reply—"I'm blessed if that's known!"
S is the Scribbler who loves us so well,
T is the "Truth" he only can tell.
U is Uprightness—fits us like bark,
V our Veracity—Save ye the mark!
W's our Wallet, capacious, profound,
X the unknown—its contents, to be found.
Y is the Yell when they're asked to believe us,
Z is the Zero I think they will leave us.

New Methods and Appliances.

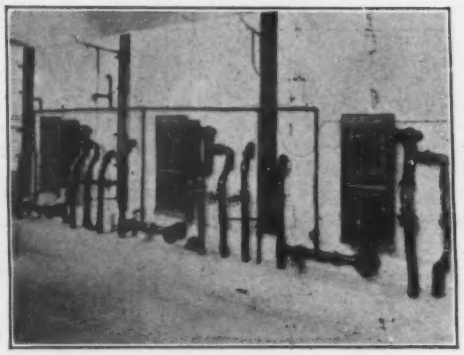
Gas Crematory, Mount Olivet Cemetery, San Francisco.—Mr. John B. Redd, Industrial Engineer, Pacific Gas and Electric Company, San Francisco, thus interestingly tells, in the last issue of "Pacific Service," the role enacted by "Pacific Service" is the last rites for the dead as performed in the beautiful cemetery of Mount Olivet:

The electric energy for operating a 50-horse power motor driven pump, which distributes water to the splendidly kept laws and flower gardens, has been supplied by the Pacific Gas and Electric Company for several years, while just recently we were again called upon to make additional electric connections and to extend our gas mains for the purpose of supplying fuel for operating the new incinerator, which, at the present writing, has been in successful operation since December 1st, 1912.

The accompanying pictures will give an idea of the magnitude of the plant, but to realize fully the operation of the incinerator, I would advise a visit to Mount Olivet, where you will meet the Superintendent, Mr. M. Jensen, a gentleman who is willing at all times to show visitors the workings of the plant. Many people who, having shuddered at the thought of cremation, have witnessed a case at this plant and gone their way thoroughly convinced that cremation is the best and by far the most hygenic method of disposing of our honored and respected dead.



Retort Chamber.—Front View.



Retort Chamber.—Back View.
Figs. 1 and 2.

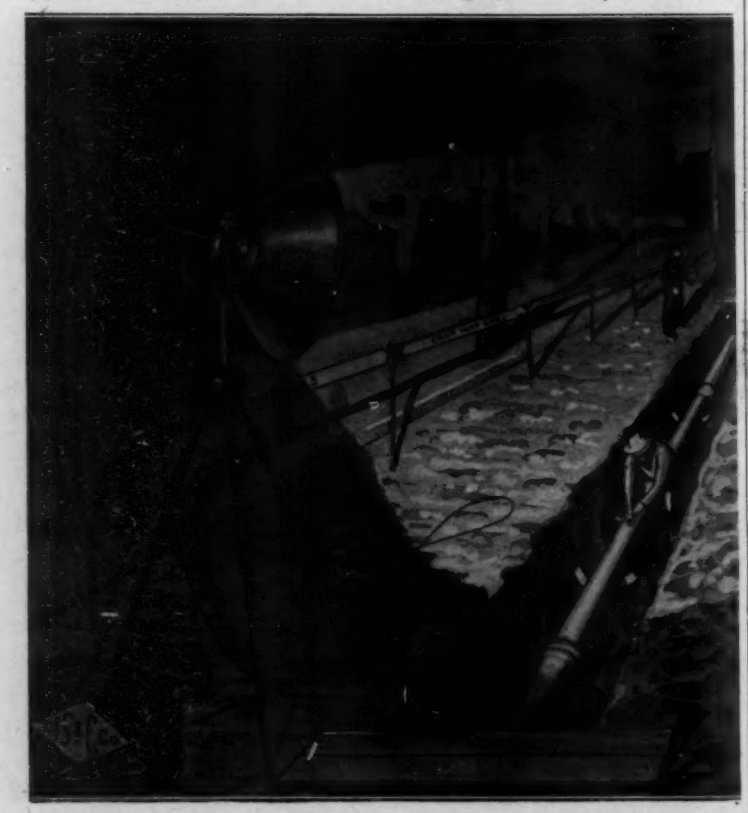
Incineration has gained in popularity rapidly since 1883, when the total number of cremation in the entire United States was only 25, while the latest official statistics show 6,665 for the year 1909. Unofficial reports since 1909 show even a greater percentage of increase per year.

Gas has many advantages over all other fuels used for this purpose, practically since the products of combustion and smoke can be controlled and forced into a low combustion chamber, where all unburned gases and smoke are consumed by the use of a secondary blast burner, directed against checker brickwork built in the throat of the chimney. All of the gas burners are of the blast type, the air being supplied at 2 pounds pressure from a positive blower (capacity 600 cubic feet per minute) direct connected to a 3,400 R. P. M., 10-horse power motor. The gas is supplied from a high pressuse main, and reduced from 40 pounds to 9 inches of water pressure by the use of two large regulators.

A 200-light meter registers the gas used, and is connected to a 4-inch pipe or main which entirely surrounds the 3 retorts. The air main

which is 6 inches in diameter, also surrounds the retorts, making a complete circulating system for both gas and air. Two-inch pipe connects from the main to each set of burners as shown in Fig. 2. Fig. 1 being a front view of the incinerator, showing one retort with both doors open, one with the fire door closed, and both doors closed on the center retort.

THE MONARCH PORTABLE STREET LAMP.—Emergency work or other work requiring all-night service can be materially helped by the appliance illustrated. It is an electric light, with a powerful re-



flector, mounted on an adjustable tripod, that can be located to light the bottom of ditch or unlighted parts of the works, to facilitate night repairs, etc. It is furnished with a storage battery and lamp, giving 300-candle power, and is the latest addition to the line of Monarch Storage Battery Lamps, sold by the Connelly Iron Sponge and Governor Company.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,058,716. Prepaid Gas or Like Meter. F. H. Bostock, Nottingham, England.

1,058,966. Hydrocarbon Gas Producer. A. Hackett, Toronto, Canada.

1,059,001. Gas Burner. A. S. Plowman, New York City.

1,059,086. Igniting Device for Gas Stoves. B. D. Stevenson, Harvard, Ills.

1,059,277. Integrating and Recording Apparatus for Meters. F. N. Connet, Providence, R. I., assignor to Builders' Iron Foundry, same place.

Items of Interest
FROM VARIOUS LOCALITIES.

MANAGER MCCORKINDALE, of the Wilmington (Del.) Gas Company, reports that not long ago the treasury of the corporation was enriched by the receipt of 25 cents, which it was requested should be placed to the credit of the "Conscience Fund." Maybe that's a starter, "Mr. Mc."!

THE Laclede Gas Light Company, of St. Louis, Mo., has instructed Mr. A. J. Robus, Chief Engineer, the Arthur-Robus firm of Consulting and Contracting Engineers, of the Pierce Building, St. Louis, to furnish designs and supervision details respecting the construction of the Laclede Company's proposed new installation of retort benches.

THE rate for gas distributed in the Second ward, Queens County, Brooklyn, N. Y., has been reduced to 95 cents per 1,000 cubic feet, a concession of 5 cents per 1,000. This is the result of a conference between the Companies and the malcontents, who have been trying, in season and-out for the last 3 years, to have the rate reduced to 80 cents. The contention in some respects was amusing, for many of the residents, who were contending for the cheapening can still "point with pride" to grand specimens of the original sturdy oaks and hickory trees that heretofore covered the land, right in line with the street lines as their next door neighbors. This is no suffragistic theory, for the writer picked hickory nuts in the fall season 45 years ago, and while going through Forest Hills - a part of the affected district—last fall, in an automobile directed by Mr. George A. Bronder's chauffeur, did the self-same trick! Yet those who dwell in the "aboriginal forest" would have a gas rate equal to that charged the denizens, say of Wall street, where the fruit of the forest's monarchs may only be found on the fruiter's stand, "at a price." No, you can't have the glory of the woods, and the comfort of gas, without remembering that the gas man is worthy of his hire.

"B. B. R.," writing from Key West, Fla., under recent date, says that, at a meeting of the local Gas Company's Employees' Association, held the night of the 21st ult., interesting papers were read, respectively, by Messrs. M. F. Sands, R. E. Edwards and G. W. Almour. Their topics (in the order named) were: "Manufacture of Gas;" "The Free Lighting Proposition for Residences;" and "Salesmanship." In addition, Mr. Charles Miller described the installation of a "fire circulation" apparatus or device in the "Key West Fire Department," which keeps the water in the boilers of the fire engines at a temperature of say 200° F., at times when the engines are awaiting a call. Manager Vecker gave a general talk on how best to induce a person to become a gas user on domestic account, and Engineer Collins also spoke interestingly on the subject of gas manufacture. The assembling was a thorough success, from the standpoints of technical worth and sociability sustaining. Respecting the latter it was determined to arrange in the near future for a "hay ride" and a dance.

"L. L. R.," writes us that the residents of the Manhattan View section of no longer drowsy old College Point, Long Island, are to have a gas supply, the work of hooking-up the Flushing Company's mains to the service pipes of Manhattan View, having been entrusted to the Sullivan Brothers, of Flushing, which means that the work will be done to the satisfaction of Mr. Spear's Company and to that of the Manhattan Viewers as well.

WITH much regret we report the death of Mr. J. Scott Funkhouser, until recently Manager and a leading proprietor of the Staunton (Va.) Gas Company, whose demise occurred the morning of Thursday, the 17th ult. Deceased, who was one of the foremost business men of Staunton, was born in that city, April 12th, 1863.

MR. M. D. SPENCER, Manager of the Everett (Wash.) Gas Company, has resigned that position, to become effective June 1st. He then leaves for Portland, Ore., his former home, where he proposes to engage in the real estate business.

MR. A. H. WISE, for the past year or so on the staff of the Fulton County (N. Y.) Gas and Electric Company, has resigned to engage in a mercantile business in Gloversville, N. Y.

MR. I. A. BLALOCK has resigned the position of Manager of the Gainesville (Fla.) Gas and Electric Power Company. His successor is Mr. J. Wright Reeves, formerly of Atlanta, Ga.

THE City Council, of Pennington, N. J., has granted a franchise to the North Jersey Gas Company to lay mains through the streets of the named place. Mr. J. A. Riggin, President of the latter, assured the authorities that the supply would be laid on in 60 days from the consent of the Public Utilities Commission.

REPRESENTATIVES of nearly all the Wisconsin Cities in which gas or electricity is supplied visited Milwaukee on the occasion of the hearing conducted in School Board Chambers, City Hall, by the State Railway Rate Commission, which body was investigating the utilities to determine whether standards of pressure and quality fixed in 1908 are inapplicable at the present time. Some of the stipulations which it was proposed to enact were: Prohibition of meters varying in excess of 2 per cent.; meters to be tested every 4 years, and ad-

justed when varying in excess of 1 per cent.; the keeping of all data on each meter; accurate meter provers to be maintained by each company; the testing of meters to be compulsory on part of companies on complaint of consumers, provided complaints are not made oftener than once in 6 months; the Commission to make tests at consumer's request, provided the latter forwards fee for same, which fee is refunded if meter is found over 2 per cent. in error; gas bills to give dates of readings and registration at time of reading and of previous reading. Mr. R. S. McBride, Bureau of Standards, Washington, D. C., defined the requirements in this instance as laid down by the National Bureau. Amongst those present were: W. T. Fellows; F. Vaughan, Washington, D. C.; W. L. Wadsworth, Minneapolis; C. G. Durfey, Rochester, N. Y.; P. H. Bartlett, Philadelphia; and E. G. Cowdery, Peoples Gas Light and Coke Company, Chicago.

THE Riter-Conley Company, of Pittsburgh, Pa., has been awarded the contract for the construction of the storage holder to be erected for the Philadelphia Suburban Gas Company on the site owned by it at Front and Tilghman streets, Chester, Pa. The vessel will have 5 lifts, will be 223 feet in diameter and 150 feet in height, and will be up to retaining 3 millions cubic feet. It is to rest in a steel tank.

THE expert connected with the Public Service Commission, Second New York District, has passed favorably on the application of the East Syracuse Gas Company to purchase the franchise of Louis Burkhard to construct a plant for the distribution of gas in and to that community. There was no opposition before the expert, and none is expected at the final hearing before the Board. The Company will also be authorized to issue bonds in an amount not to exceed $50,000.

"BEEBE," writing from Detroit, Mich., under date of the 28th ult., says: "Mr. James L. Geddis, in the service of the Detroit City (Mich.) Gas Company since 1890, and who succeeded Mr. O'Brien as the Corporation's Treasurer in 1912, has resigned. He did so in order to assume the duties of Treasurer of the Kelly-Springfield Motor Truck Company, of Springfield, O. Shortly after he announced his resignation he was presented by the office staff of the Gas Company with a solitaire diamond ring—a "gem of purest ray serene."

THE gentlemen interested in the promotion of the Amherst (N. Y.) Gas Company, the incorporation of which was recently reported in the JOURNAL, are these—insuring beyond a doubt the fact of the concern's reliability: Howard A. Forman, James W. Murphy, John M. Satterfield and Arthur E. Hedstrom, of Buffalo, N. Y.; Henry B. Huver, of Williamsville; W. Allen Gardner and Michael Fischer, of Snyder. The Company is capitalized in $100,000.

THE Gas Machinery Company will construct, for the Ottumwa (Ia.) Gas Company, the benches and apparatus for a complete new coal gas plant, these being the chief items: Seven benches of 6's, with silica retorts and settings, an operating floor, exhausting, condensing, washing and scrubbing apparatus, purifiers, connections and ammonia concentrating apparatus. The Ottumwa folks have had to purchase a site for this installation, and the plans, in connection with the construction noted, also call for new buildings and a storage holder.

MR. W. H. MATLACK, JR., Assistant Superintendent, Henrico County Gas Company, Barton Heights, Richmond, Va., is directing a letter contest, offering as prizes, waffle irons, griddles, iron holders, toasters and friction lighters. The prizes are to be awarded to the composers of the best letters, not to carry more than 100 words, telling why the gas range is best for cooking. Only the consumers of the Company are permitted to enter the contest, and the awards to be made in connection therewith will be published the 1st prox.

IN connection with the above mention it may be noted that the Henrico County Gas Company has commenced the work of piping the streets in the outlying settlement of Highland Park.

SUPT. CATTELL, of the Parkesburg (Pa.) Gas Company, in the last 2 weeks of April installed 125 meters for new patrons. The use of gas on industrial fuel account is growing rapidly, a recent notable addition in this respect being a metal working shop, all the smelting machines being now equipped for gaseous fuel.

HEREAFTER the Washington street bridge, Wilmington, Del., will be lighted by means of gas arcs, which are to be maintained at the rate of $55 per year each, that price to include installing, the necessary gas supply maintenance, and lighting and extinguishing, on a lighting table beginning at dusk, and terminating at daylight each night in the year.

MISS LENA ALLEN, for quite a while bookkeeper in the office of the Hudson (Mass.) branch of the Marlborough-Hudson Gas Company, has resigned from that service to accept a place in the executive offices of the Walloquotoc Spinning Company.

AT the annual meeting of the Chuctanunda Gas Light Company, Amsterdam, N. Y., the following officers were chosen: President, Hon. Jno. K. Stewart; Vice-President, Wm. H. Cooper: Treasurer, D. D. Cassidy, Sr.; Secretary, D. D. Cassidy, Jr.

THE Belt Gas Company, of Deadwood, So. Dak., has induced caterer Bailie, who operates the best restaurant in Deadwood, to install and use a modern gas range of the hotel type. The range has 240 square feet of cooking surface, to say nothing of the ovens.

FOR the 3 months ended March 31st the United Gas Improvement Company sold 2,552,544,060 cubic feet of gas in Philadelphia, as against 2,498,053,140 in the corresponding quarter of 1912; and as against 2,329,862,310 in the corresponding quarter of 1911. *Mirabile visu.*

EVERYONE interested in the careful management and operation of boiler systems should secure from the Joseph Dixon Crucible Company, Jersey City, N. J., a copy of its latest brochure entitled, "Graphite for the Boiler."

THE proprietors of the Anniston (Ala.) Electric and Gas Company have at last succeeded in getting up an appropriate and convincing display of gas appliances, the Company's offices having been enlarged to the point which enabled a right and convenient disposition of the large line of these goods which the Company has carried for years.

MR. WALDO C. BILL (brother of Mr. B. P. Bill, of the Springfield, Mass., Company) who has been connected with the Capital City Gas Company, of Montpelier, Vt., for a number of years, last Thursday assumed the duties of Superintendent of Works, Portland (Me.) Gas Light Company, vice the late Mr. E. H. Yorke.

MRS. MARGARET E. DWINELL last week concluded a 3-day series of lecture demonstrations on cooking by gas at the instance of the Easthampton (Mass.) Gas Company. The lectures were given each afternoon and evening, and the large attendance was enthusiastic at times over the work of the demonstratress.

THAT Mr. John H. Keppelman knows how to keep the boys together was again nicely shown at the last meeting of the Consumers Gas Company's (Reading, Pa.) Employees' Association. The chief topic for the evening was a clever paper on "Gas from Its Discovery," prepared by Mr. E. A. Gicker. Other matters that looked and sounded well, respectively, to those present were: A short, snappy "talk" by Mr. Keppelman, and a well shown set of stereopticon views, showing gas industrial appliances in and around Reading, the manipulator of the slides being Mr. E C. Romine. A string orchestra rendered some up-to-date musical numbers, and palatable refreshments made the party all the merrier. The officers elected were: President, E. A. Gicker; Vice-President, Frank E. Harris; Secretary, H. M. Ellis.

MR. E. E. COLLINS, who is said to "represent Eastern capitalists," has applied to the Council of Bemidji, Minn., for a franchise to construct and operate a gas works there. He asks for a 25-year grant, proposing to supply a 600 heat unit gas of 18-candle power, at a price not to exceed $1.50 gross, or $1.35 net, per 1,000, and a minimum monthly bill of 50 cents. Testing apparatus will be maintained in the city hall, and it is agreed that the plant shall be in operation within 9 months from franchise date; that not less than 2 miles of mains shall be laid the first year, and that additional mains may be ordered by the Council. Failure to lay the latter within a specified time gives the city authorities the right to lay the same, charging the cost thereof to the Company. The city is to have the right to purchase the works at any time at a price to be agreed upon by arbitrators, one of whom is to be selected by the city and one by the Company, such two to name a third. Bemidji is a beautifully located summer resort on a similarly named lake, on the Great Northern and the Brainard and Northern Minnesota Railroads, at a point 175 miles west-northwest of Duluth. It is now attaining quite some commercial importance, mainly in the lumber line. The population has more than doubled since 1900—then it was 2,183—now it is 5,620, and its growth is of the substantial sort.

The Market for Gas Securities.

The bears had a pretty good share of what was going on in the Exchange during the week; that is, until yesterday (Thursday) when the operators for the long side caused some quick covering that resulted in a gain during the session of about 66 per cent. of the shrinkage in a week. Consolidated sold down to 127; but came in to-day (Friday) at 129½ to 130. The Company's regular quarterly dividend of 1½ per cent. has been declared. It is payable the 16th prox. The Bronx (N. Y.) Gas and Electric Company has been authorized by the Public Service Commission to issue $200,000 of first refunding 5's, to mature in 1960. It is stipulated that the selling price shall not be less than 95, and it is further directed that the moneys received shall be spent for acquisition of property and as reimbursement for money already expended in betterments. The Knickerbocker Trust is the Registrar. This Company's progress is most satisfactory to its proprietors.

Brooklyn Union is ¼ point lower in the bid, but transactions in it are to all intent nil. This stock as a whole is in exceedingly strong hands, and the technical condition of the property shows continuous and really remarkable improvement. The annual meeting of the U. G. I. gas corporation is set for Monday, the 5th. This year's working shows the great concern to have gained steadily. During the year it earned 13.56 per cent. on its total business, and the sum of $2,309,995 was carried to undivided profit account, the balance of the latter now standing at just inside of 30 millions, or well over 53 per cent. of its total capital.

The new convertible 5 per cent. debentures, emitted by the Baltimore Consolidated Company, have been thus disposed of: $1,000,000 were taken locally, and $2,500,000 of the $3,500,000 issued has been absorbed by Messrs. Kitcat & Aitken, of London, England. The price to the public was 96, which means a yield of 5.20 per cent. This Company well reflects the benefits of intelligent, conservative management.

The remarkably low quotation of 95 for Laclede common really passes understanding. The returns of the corporation, for the quarter ended March 31, show an earning of $2.25 per share. Last year, for corresponding quarter, the showing was $2.17 per share. The cash on hand figured at $359,000.

The net earnings of the Boston Consolidated Gas Company for the past 9 months show a gain of 8.7 per cent., as compared with the return for the like three-quarters of a 12 month ago, and all through the East the percentage gains are most satisfactory.

The Peoples Gas Light and Coke Company, under the clever guidance of that past-master of pacifiers, Mr. Sullivan, goes along evenly, despite threats and rumors of threats on the part of the City Fathers. Nevertheless, for a 7 per cent. security, its quotation (to-day Friday, of 109½ to 110½) is a poor representative of its actual value.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

MAY 5.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	99,816,500	100	129¼	130
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	5,000,000	1,000	101	103
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,500,000	100	157	162
Detroit City Gas Co.	6,580,000	—	—	50
Detroit Gas Co., 5's	881,000	1,000	75	80
" Prior Lien 5's	5,619,000	1,000	97	100½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	59	62
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98¼	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	96	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	102
Standard	5,000,000	100	102	104
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	12 3¼	13
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	299,650	500	120	—
Out-of-Town Companies.				
Bay State	50,000,000	50	¾	3.16
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Essex and Hudson Gas Co.	6,500,000	—	133	136
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,250,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	130	133
" Bonds, 5's	10,500,000	—	104	106
Indianapolis	2,000,000	—	7	80
" Bonds, 5's	2,650,000	—	30	93
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	96
Bonds, 1st 5's	3,322,000	1,000	98½	99
Laclede Gas Co., St. Louis	10,000,000	100	93	95
Preferred	2,500,000	100	99	102
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,370,000	50	130	150
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	108	
Massachusetts Gas Companies, of Boston	25,000,000	100	87½	88
Preferred	25,000,000	100	89	89½
Montreal L. H. & P., Canada	9,000,000	100	235½	236
Nashville Gas Light Co.	1,000,000	100	110	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, Richmond, Va., October 15-17, 1913. Officers: President, W. R. Addicks, New York City. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting Sept. 1913. Officers. President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 8, 1913. Officers: President, C. G. M. Thomas, Long Island City, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street, New York City.

Gas Meters.—Monthly Section Meetings; Grand Commissioner, I. W. Petty, New York; Gen'l Sec'y, H. Thurston Owens, La Crosse, Wis.; New York Section, Chairman, Will W. Barnes; Secretary, John M. Brock, 204 Percy street, Flushing, N. Y. Philadelphia Section; Chairman, L. R. Dutton; Secretary, H. F. Patterson, Jr., 831 Chestnut street. Cleveland Section, Chairman, F. R. Hutchinson; Secretary, Wm. Holtz, East Ohio Gas Co. New England Section, Chairman, F. M. Roberts, Haverhill; Sec., F. K. Wells, 60 Broad street, Boston. Winona Section, Winona, Minn., W. F. Clausen, Chairman.

Guild of Gas Managers of New England.—Annual meeting, March, 1913. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 18th and 19th, 1914. Chicago, Ills. Officers: President, W. F. Barrett, Chicago, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting,———— September, 1913. Meetings of Sections, monthly. Pres., Preston S. Millar; General Secretary, J. D. Israel, 29 W. 39th street, New York City. Sections: New York, Secretary, C. L. Law, 124 West 42d street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, J. B. Jackson, 28 North Market street. Pittsburgh, Secretary, J. C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March —— —— 1914. Terre Haute. Officers: President, A. S. Cooke, Terre Haute; Vice-President, A. C. Blinn, Evansville; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, May 7, 8, 9, 1913; Burlington, Ia. Officers: President, C. W. Fair, Atlantic, Ia.; Secretary, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October—— 1913. ———— Officers: President, L. O. Ripley, Emporia, Kas.; Secretary and Treasurer, W. H. Fellows, Leavenworth, Kas.

Michigan Gas Association—Annual meeting, September, 17, 18, 19, 1913; ———— Officers: President, W. S. Blauvelt, Detroit, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1913; Mexico, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting and gas show, Dec. 1-6, 1913. Philadelphia, Pa. Officers: President, C. W. Hare, Philadelphia Pa.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, Cleveland, O., May 20 22, 1913; Officers: President, M. B. Daly, Cleveland, O; Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, 18th and 19th, 1914 Boston. Officers: President, T. H. Hintze, Providence, R. I.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Annual Meeting July —, 1913, Asbury Park N.J. President, C. F. Butcher, Freehold, N. J.; Sec'y-Treasurer, O. F. Potter, Newark, N.J.

Ohio Gas Association.—Annual meeting, February ————, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, Oklahoma City May, ——1913. President, F. W. Caldwell, Shawnee, Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, San Jose, Cal., September 16, 17, 18, 1913. Officers: President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, Henry B stwick, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, Allentown, Pa., April ————, 1914; Officers, President, J. A. Frick, Allentown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 11, 1913; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, Mobile, Ala., April 4, 1914, Officers: President, James Ferrier, Rome, Ga.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. May 21, 22, 23 and 24, 1913, Galveston, Tex. Officers: President, F. M. Lege, Jr., Galveston, Tex.; Secretary H. S. Cooper, 405 Slaughter Bldg., Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 14 and 15, 1913, Milwaukee, Wis. Officers: President, I. F. Wortendyke, Janesville, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.